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Evaluation of 3M Tape vs. Poly-Carb Striping and Striping Warranty

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15. Supplementary Notes The investigation was conducted in cooperation with the U. S. Department of Transportation, Federal Highway Administration.			
16. Abstract <p>The objective of this study was to find the best, most highly visible and long lasting striping for Missouri's major highways. MoDOT currently has a contract with the 3M Company for the installation of Preformed Pavement Marking Tape for longitudinal striping on divided major roads but the contract will be ending in 2011. Tape has been found to be one of the best wet-reflective pavement markings so far but costs up to \$5 per linear foot. The contract being studied was awarded on July 23, 2008 to Poly-Carb Inc. to provide Striping and a Striping Warranty on 235 linear miles of longitudinal striping on various roadways in the St. Louis and Kansas City areas.</p> <p>The way the whole process was done was innovative. It was a performance based warranty contract. Rather than specifying certain materials, the Department went out with a Request for Bids (RFB) that listed the requirements of how the stripe was to perform and let the bidders propose how they would meet those requirements. Asking for a four-year warranty was also something new for MoDOT. While there is a four year warranty with 3M, this was the first time to ask for a warranty on pavement markings using a bidding process and specifying a payment schedule linked to that warranty.</p> <p>The Striping Warranty will be in effect until June 30, 2013. The contractor put down about 2.9 million feet or 550 line miles of the product. The final cost of the contract was \$6.56 million, making the cost per linear foot \$2.37 compared to the current \$5 per linear foot for Preformed Pavement Marking Tape. Initial inspection results were very good with good color and very high retroreflectivity readings and initial payments were made with no corrections needed to the markings. Performance measures will be watched closely for the next four years. This study will evaluate both the quality of the pavement marking and the effectiveness of the performance based warranty to lower costs.</p>			
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Construction Phase Report

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and Striping Warranty**

Prepared for
Missouri Department of Transportation
Organizational Results

by
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Missouri Department of Transportation

Acknowledgment to:
James Brocksmith

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The opinions, findings, and conclusions expressed in this publication are those of the principal investigators and the Missouri Department of Transportation. They are not necessarily those of the U.S. Department of Transportation, Federal Highway Administration. This report does not constitute a standard or regulation.

EXECUTIVE SUMMARY

The objective of this study is to find the best, most highly visible and long lasting striping for Missouri's major highways. Preformed Pavement Marking Tape has been found as one of the best pavement markings so far but it costs up to \$5 per linear foot. MoDOT currently has a contract with the 3M Company for the installation of longitudinal markings on divided major roads but the installation contract will be ending in 2011. The objective of using the kind of performance based warranty contract being evaluated by this study is to see if other products could be found that are just as good and more economical. The contract being studied was awarded on July 23, 2008 to Poly-Carb Inc. to provide Striping and a Striping Warranty on 550 lane miles striped on various roadways in the St. Louis and Kansas City areas.

The way the whole process was done was innovative. It was a performance based warranty contract. Rather than specifying certain materials, the Department went out with a Request for Bids (RFB) that listed the requirements of how the stripe was to perform and let the bidders propose how they would meet those requirements. Asking for a four-year warranty was also something new for MoDOT. While there is a four year warranty with 3M, this was the first time to ask for a warranty on pavement markings using a bidding process and specifying a payment schedule linked to that warranty.

Researchers observed application of the Poly-Carb striping system on jobs in the St. Louis area and Kansas City area. Also observed for comparison of the application process was one section using 3M tape. During these inspections the Width, Alignment and Appearance tolerances in the contract were verified. Retroreflectivity readings were made by MoDOT's contracted service using a mobile retroreflectometer that measured the retroreflectivity at 7 to 45 days after the marking was placed per the contract requirements. The contractor put down about 2.9 million feet or 550 line miles of the product. After accepting a Value Engineering proposal the cost of the contract was \$6.56 million, making the cost per linear foot \$2.37 compared to the current \$5 per linear foot for Preformed Pavement Marking Tape. Initial inspection results were very good with good color and very high retroreflectivity readings and initial payments were made with no corrections needed to the markings. As mentioned above the initial benefit is the cost. Performance is what MoDOT will be watching closely for the next four years. The 3M contract runs out at the end of 2011 so MoDOT will need to have a good idea of how it is performing and meeting the warranty provisions by the middle of 2011. The performance requirements of the warranty contract on retroreflectivity, color and presence of the striping, however, will be tested for four years and remaining warranty payments will be awarded only if the requirements are met.

The performance based warranty contract is a good fit for a project like this. The results suggest that a maintenance type item like pavement marking works well with a warranty contract. The contract duration, length and cost all fit this kind of contract. The quality of the end product has been easy to measure and it will be shown over the next four years (pay periods) whether the performance criteria picked is the correct measure for this kind of performance based warranty contract.

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Introduction

The Missouri Department of Transportation (MoDOT) is trying to continually improve the striping on our highways. The roadway visibility plan for major roads established in 2005 requires all permanent pavement marking white lines and yellow edge lines should be 6 inches (150 mm) wide. All major, divided highway projects to be constructed between January 1, 2007 and December 31, 2011, will be covered under the Missouri Highways and Transportation Commission Contract Services Agreement with 3M. The 3M tape contracts have been used to improve striping on major highways and the pavement markings have a four-year manufacturer's warranty. The tape is doing a good job and is long lasting; it has lengthened the time to re-striping to four years. It has an average price of five dollars per linear foot. The contract expires at the end of 2011 and MoDOT is looking for a quality wet-reflective striping system at a more economical cost. Subsequently, a Request For Bids to provide Striping and a Striping Warranty throughout the state of Missouri with a contract period from the Notice to Proceed (which was in August 2008) until June 30, 2012 was advertised. Poly-Carb Inc. had their proposal picked and their marking system, which they call Day-Night Visibility system, or Poly-Carb DNV, will be used in this contract on some major highways. This study will compare the 3M and Poly-Carb DNV products for their cost, length of service and visibility.

This project was the first time a performance based warranty contract was used for striping. Rather than specifying certain materials, the Department went out with a Request for Bids (RFB) that listed the requirements of how the stripe was to perform and let the bidders propose how they would meet those requirements. Asking for a four-year warranty was also something new for MoDOT. While there is a four-year warranty with 3M for repair or replacement of the tape, this was the first time to ask for a warranty on pavement markings using a bidding process and specifying a payment schedule linked to that warranty.

Objectives

The objective of this study is to find the best, most highly visible and long lasting striping for our major multi-lane divided highways. Striping on these highways is expensive and the best value for a superior product is the goal of this project. Additionally the use of a performance based warranty contract will be reviewed and observations on its success and possible future uses will be made.

Present Conditions

MoDOT currently has a contract with the 3M Company for the installation of lane lines markings on all major, divided highway projects to be constructed between January 1, 2007 and December 31, 2011. After 2011 pavement markings on major divided highways will have to be addressed. It is hoped that the Poly-Carb Striping will perform as well and that the competition will bring costs to MoDOT down. Additionally the performance based warranty contract will be analyzed to see if it is structured well and is also a means to bring contract costs down and still provide the quality pavement striping that MoDOT is committed to provide.

The statewide striping program is currently, 98,000 line miles. This system however is proposed for use only as lane lines on major divided highways the same as 3M tape. MoDOT had previously tried the Poly-Carb DNV striping material on a 10-mile test section in its Northeast District area and it looked promising. A Request for Bids was sent out in June 2008 to seek bids from qualified organizations to provide Striping and Striping Warranty throughout the state of Missouri through June 30, 2012. The bid selected came in from Poly-Carb Inc. for \$7.16 million and afterward a Value Engineering proposal by the contractor saved about \$600,000 so the final contract price was \$6.5 million. The contract was awarded on July 23, 2008 to provide Striping and a Striping Warranty on various roadways in the St. Louis and Kansas City areas. The contractor was also asked to provide a breakdown of costs per one mile of divided highway that worked out to be \$27,940.31 (based on total contract price of \$6,565,973). Because the contract was finalized late in August 2008 Poly-Carb also asked for an extension to finish the striping application until July 1, 2009 and also the payment schedule until June 30, 2013 which MoDOT accepted.

As a comparison for the pricing of the warranty system, MoDOT provided an estimate of the cost of the current pavement marking system. The example used one direction of a divided highway, one mile in length. The estimate was based on the following materials:

Lane Lines are tape installed once.

Egelines are contractor applied wet reflective paint installed the first year and re-striped by MoDOT forces with high build wet reflective paint in year 2, 3 and 4.

Current estimated costs for MoDOT, per mile of a two lane, one direction divided highway are: Asphalt - \$13,851.02 per mile, Concrete - \$14,775.02 per mile

The contractors submitted a single price for striping both asphalt and concrete pavement on the original \$7,166,400 bid that was \$30,557 per mile of a two-lane one direction divided highway. Figured using the final cost after the VE proposal of \$6,595,973 it was \$27,940 per mile of a two lane, one direction divided highway. Table 1 below compares the prices.

Table 1 - Cost for four years of wet reflective striping per mile of a two lane, one direction divided highway

MoDOT wet reflective paint on Asphalt	\$13,851.02
MoDOT wet reflective paint on Concrete	\$14,775.02
Poly-Carb Bid	\$27,940.31

The performance based contract on this job that spreads the payment out over four years will be studied to gauge its performance against a standard contracted application with a traditional warranty.

Technical Approach

Construction Phase

Researchers observed application on at least one Poly-Carb application on jobs in the St. Louis area and in the Kansas City area. They observed application of at least one section using 3M tape on a major highway for a comparison of the application procedures. During this inspection they verified the Width, Alignment and Appearance tolerances in the contract. A visual inspection to check the quality and retroreflectivity was made by the researchers. Also a review was made of the Laserlux readings taken by MoDOT's on call testing contractor to do the Quality Control testing measured at 7 to 45 days after marking was placed per the contract requirements. The testing was done by Precision Scan LLC on striping completed in 2008 and BC Traffic Engineering for all striping done in 2009. MoDOT will gather retroreflectivity data from five (5) evaluation periods; the one initial evaluation has been completed and four warranty evaluations will be made annually until June of 2013.

This preliminary (construction phase) report is being prepared to document the project and application of the markings. A yearly warranty evaluation (inspection) will be performed from April 1 – June 1 prior to each payment period as per the contract. An annual report will be made for the second, third and fourth years of the project ending in 2013, with the last report summarizing all work done under warranty, condition of the striping and gauging the success of the warranty contract.

Warranty Contract

A literature review was done to investigate other states practices on striping and specifically on warranty contracts. The greatest use of warranties was in the areas such as bridge painting, pavement markings, and freeway management. Virginia, Illinois, and Montana have used warranty contracts on asphalt pavements and grading jobs and Washington State mentioned paving, bridge painting, landscaping and pavement striping but did not elaborate on the striping.

An insightful reference to this project was found in a paper on Pavement Warranties: A Developing Trend by Bob Brooks of the Washington State Department of Transportation. Here is an excerpt: "The trend over Warranty Cost can be specified as a separate bidding element if desired and the contractor would then bid an amount that might cover his costs if he were required to perform any warranty repairs during the warranty period. If no warranty repairs are required then this also could become an additional source of profit for the contractor. Some states have chosen not to include this as a separate bidding element. The contractor deserves to be compensated for this additional risk that he assumes. As with any other project, the contract is awarded to the lowest bidder. This fact acts as a mechanism to keep the potential for additional profits at a reasonable level for the work and risk involved. The experience to date shows that the typical increase in costs for these warranty contracts is running an additional 2 to 5 percent with initial contracts running higher and then costs decreasing as the industry becomes more comfortable with the process. Warranty contracts are not suitable for every project. Not all contractors are willing to participate in these contracts and they tend to tie up a contractors bonding potential for extended time periods."

The most informative reference found was a 2009 study titled, Performance –Based Contracting for Maintenance from the Transportation Research Board. There was no mention of being used for a pavement striping contract.

None of the literature studied, however, had a percentage of the total project final bid cost tied to a yearly warranty period. Others had the warranty as a separate bidding item where it was paid for above the “total bid amount”, more as an incentive payment or an incentive/disincentive. MoDOT’s approach, on this contract, was unique in that it required: “The contract will be bid as one complete total cost to provide and install warranted pavement markings on the various routes for the duration of the contract period”. This Striping and Striping Warranty contract withholds a percentage of the bid amount each year for all four years of the warranty out of the “one complete total cost”. The contractor will be allowed to repair up to 2.5% of the total pavement markings applied in a year and still receive full payment for the next warranty period. Failure of more than 2.5% of the total pavement markings will be deducted from the amount of payment due for that payment warranty pay period. If during any evaluation period more than 10% of the pavement markings are determined to have failed he will be considered in default of the contract. In other words, to get full payment of the total original bid price the contractor must meet 100% of the requirements of the contract. He may get less than the total bid price but will not receive more.

Questions asked by perspective contractors during the Request for Bids process can be found at the end of the report in Appendix A. The most asked questions about the warranty part of the contract were:

- Could the contractor request payment up front or change the percentages of the five potential payments set out in the RFB. Along this line were also questions about whether renewable bonds could be used and the amount they had to be for each year.
 - MoDOT insisted that the payment percentages stay the same and that Performance and Payment Bonds issued annually would be based on 100% of the contract work for that year.
- Also important to the bidders was what the deduction rate was between 2 ½% and 10% when you are then in default.
 - The deduction would be a straight percent for percent reduction. The amount due a contractor will be reduced by the percent of restriping they need to do over 2.5 percent. As an example, if 5 percent of the markings needed to be replaced, the contractor payment would be reduced by 5 percent.
- For the purposes of defining default, does the 10% maximum failure refer to 10% of the 1.0 mile segments, or 10% of all markings?
 - The 10 percent is the aggregate total of all the lines placed.
- Another asked if it was MoDOT’s intention to allow complete restriping or recapping over the stripes and only pay 2 ½% of it.
 - MoDOT’s answer was we do not want yearly recapping.

What we are ideally looking for is a system that will be put down once and will last without additional work for the full 4 years. We allow the 2.5 percent realizing that even the best-designed system will have some failures out on the road.

Results and Discussion (Evaluation)

The Missouri Department of Transportation (MoDOT) is trying to continually improve the striping on our highways. The roadway visibility plan for major roads requires all permanent pavement marking, white lines and yellow edge lines, should be 6 inches (150 mm) wide. A continuous effort to improve wet night reflectivity is also being pursued by MoDOT by using high retroreflective marking materials and by using milled in rumble strips with striping done over them on edgelines. MoDOT management decided all major, divided highway projects to be constructed between January 1, 2007 and December 31, 2011, would be covered under a Contract Services Agreement with 3M. The 3M-tape contract striping has been used on construction projects to improve striping on major highways and it has a four-year manufacturer's warranty. A new contract will be needed after 2011 and it was decided to put out a Request For Bids (RFB) on a selected number of projects to evaluate new striping systems and to try and get a lower price than MoDOT is now paying. A RFB to provide Striping and a Striping Warranty throughout the state of Missouri with a contract period from the Notice to proceed (which was in August 2008) until June 30, 2012 was advertised. Poly-Carb Inc. had their proposal picked and their product which they call Day-Night Visibility or Poly-Carb NDV system was used on designated projects in the St. Louis and Kansas City areas. Over 2.9 million feet or 550 line miles of pavement marking was installed. This study will compare the two products (3M Tape and Poly-Carb Striping System) for their cost, length of service and visibility.

Poly-Carb's bid on the original RFB for the 12 pavement sections in Kansas City and the 6 in St. Louis was \$ 7,166,400 or about \$ 2.57 per linear foot of pavement marking installed. They made a Value Engineering proposal that was accepted at \$ 6,656,973. This was a savings to MoDOT of \$600,427 but it included some changes in the contract.

The Items included were:

1. Project completion date of July 1, 2009. (Changed from October 31, 2008)
2. Work allowed during the day and night except rush hours.
District coordination and consent is required.
3. The following retroreflectivity requirements:

Retroreflectivity: mcd/m ² /lux	White	Yellow
Initial RR Performance	450	300
Warranted (4 years)	200 (was 250)	150 (was 175)

Rumble Strips are exempt from retroreflectivity requirements.

4. All edge-line and skip-dash markings will contain wet-reflective media.
Gore markings will not.
5. Contractual payment terms of 60% upon completion and 4 payments of 10% each. Bi-weekly progress estimates shall be submitted. Work performed and completed (*in 2008*) will have warranty evaluations in 2009. (See Payment Percentages table below.)
6. POLY-CARB will be able to correct any pavement markings installation prior to MoDOT's initial acceptance/payment.

Additionally the payment schedule was changed from - to:

Table 2 – Change in Payment schedule

Payment schedule			New Payment schedule	
When	Pay Period		When	Pay Period
December 31, 2008	1		August 30, 2009	1
June 30, 2009	2		June 30, 2010	2
June 30, 2010	3		June 30, 2011	3
June 30, 2011	4		June 30, 2012	4
June 30, 2012	5		June 30, 2013	5

It is easier to compare the changes in the payment percentages in item # 5 above by showing the Payment Percentages table. The original percentages that were in the RFB, and also contained in Poy-Carb's original bid, are in parenthesis.

Table 3 – Change in Payment Percentage Table

Payment Percentages Table	
Evaluation Period	Maximum Percent of Total Contract price Available
Initial Performance	(12) 60
Warranty Performance 1	(22) 10
Warranty Performance 2	(22) 10
Warranty Performance 3	(22) 10
Warranty Performance 4	(22) 10

All of the six changes to the contract listed above helped reduce the contractor, Poly-Carb's, liability. Eliminating retroreflectivity on gore points probably had little change to the value of the striping. All of the other changes however were the contractor's attempt to limit his liability on the warranty part of the contract. The change from 12% to 60% on the initial payment also helped pay most of the construction costs up front and surely helped lower his surety bonding cost. MoDOT believed this was a good change for the value they were receiving, plus the \$600,000 savings from the original bid, and accepted the Value Engineering proposal.

Poly-Carb hired Park Mark as a subcontractor to do the striping in the St. Louis area. They started the project by striping edgelines only on MO 364 in the fall of 2008. This was the only work completed in 2008.

Researchers observed application on at least one Poly-Carb application on a job in the Kansas City area and the St. Louis area. Application was also observed at one section using 3M tape on MO 7 just to see how the grinding and application is being done for the preformed pavement marking tape.

The projects for the most part used existing pavements, not new construction or new asphalt overlays, so there was the issue of removing existing lines so that the new lines would look good. Contrast markings were used on the dashed lines or "skips" (on the lane lines of multi-lane highways) on concrete pavement. This is a two-step process where black paint is sprayed first

and then the white is placed on top of the black. It takes skill to do this right so the markings look good and the white has the black fully surrounding it. The contractor chose to install the pavement markings in a groove also, so the painter additionally had to make sure the stripe was all inside the groove.

Listed in Table 4 are the road segments where the work was done. Initial results are very good with good color and very high retroreflectivity readings.

Table 4 – Road Segments where Poly-Carb Striping System were Applied

In the St. Louis area:

I-55	US 61-67 to Mile Marker 188	both directions, all lines
MO 141	just north of Clayton to MO 30	both directions, all lines
MO 364	west of Bennington to 94	both directions, edgelines only, skips are 3M tape
MO 370	I-70 to just east of Elm	both directions, all lines

In the Kansas City area:

I-70	MO 7 to 291/470	both directions, all lines
I-70	291/470 to Manchester, west of I-435	both directions, edgelines only, skips are 3M tape
MO 13	Lexington to Richmond	both directions, all lines
US 24	MO 7 east to Lafayette County line	both directions, all lines
MO 291	470 to US 50	both directions, all lines
MO 291	US 50 to end of divided	both directions, all lines
MO 350	470 to 435	both directions, all lines
US 71	south of MO 7 to north of MO 291	both directions, all lines
US 71	north of 291 to 58 in Belton	northbound, edgelines only, skips are 3M tape

Specific quantities of markings and colors used can be seen in the original RFB, which is attached in Appendix A.

There were six different routes and 9 different locations in Kansas City where the Poly-Carb striping was applied. During the same inspection trip where the 3M tape installation was observed as mentioned above, the application of the Poly-Carb striping was observed on a different section of MO 291. Poly-Carb hired High Mark Traffic Services from Billings, Montana to do the striping in Kansas City. The width, alignment and appearance tolerances in the contract and in Job Special Provision JSP-08-07 were verified on the MO 291 project.



Figure 1 - Location is US 71, Jackson County in Kansas City

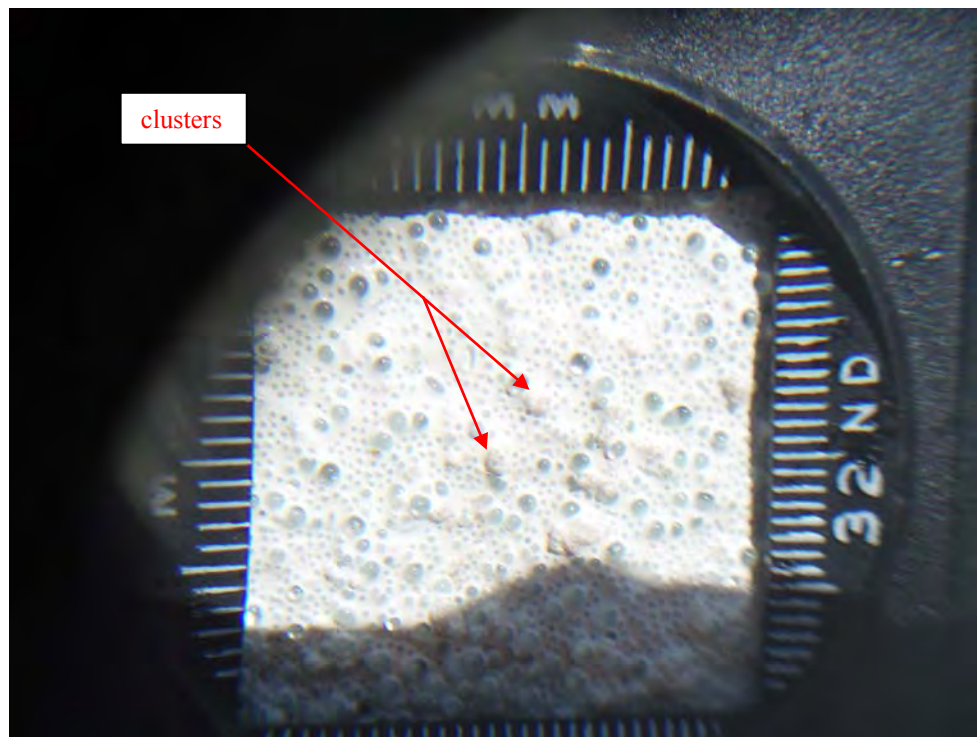


Figure 2 - Close up through magnifier shows a great number of wet-reflective beads (the clusters) the others ones are glass beads.



Figure 3 - Left edge line showing grooved or milled area in concrete that the stripe was placed within.

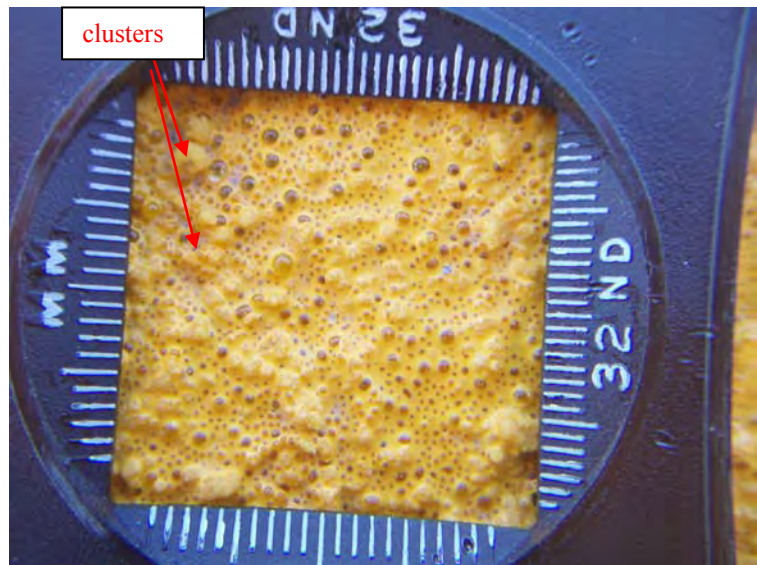


Figure 4 - Close up through magnifier shows a great number of wet-reflective beads (the clusters) the others are glass beads.

In the St. Louis area Poly-Carb had hired a different contractor, Park Mark Inc., to apply the Poly-Carb striping. There were segments of four different routes striped in the St. Louis area. On June 4, 2009 the researchers surveyed the striping application on Rte. 364 that had been completed in December 2008. The striping visually looked very good and met the tolerances in the contract. A spot check with the hand held retroreflectivity tester had been taken earlier by Jim Brocksmyth and passed specifications and also the whole route had been tested by Precision Scanning, using a mobile retroreflectivity van in December 2008 and had passed the initial acceptance values. Also observed was the striping on Rte. 370 that had already been placed. The grinding for the skips looked very good as did the placement of the white stripe inside the black background. Contrast pavement markings were required on all white dashed pavement markings when applied on concrete pavement. They have to meet job special provision, JSP 08-07, which requires a 1 1/2" border of black on either side of the white skip and the white skip shall be

located within the black paint area with black on both the leading and trailing edges. Also observed was the striping operations going on at the I-55 Southbound project, which looked good and appeared within specifications. A visual inspection was also made of MO 141 in St. Louis on August 11, 2009; this was the last section of roadway to be striped and was completed in July 2009. All the routes were later tested for retro-reflectivity by Precision Scan and passed the initial acceptance values.



Figure 5 - MO 141 in St. Louis. Note all lines are newly applied and were painted in side grooved or milled slot in the concrete pavement.



Figure 6 - Close up of dashed lane lines (skips): Note the black background paint applied within grooved area and white stripe well inside the borders meeting JSP 08-07 requirements.

The contract calls for mobile retroreflectivity van data from five (5) evaluation periods, one initial evaluation and four warranty evaluations. All initial evaluations are complete and met requirements. In the future four (4) more Warranty evaluations will be performed. They will be performed from April 1 – June 1 prior to each payment period as per the contract.

Conclusions and Recommendations

MoDOT has made a commitment to providing better more visible striping to its motorists especially on major highways. For a 4-inch line on a minor road MoDOT's cost for striping is approximately 4.2 cents per foot. This is quite a contrast with the current cost of the 6-inch wide 3M wet-reflective tape at \$5.00 a linear foot used on a major divided highway. An alternative system or kind of contracting needed to be found to reduce the cost for striping on major highways. The average cost for the Poly-Carb striping that was used for this project was less than half as much at \$2.37 per linear foot.

This Striping and Striping Warranty contract put down over 2.9 million feet or 550 lane miles of striping on 162.5 lane miles of major divided highway on routes in urban areas of Kansas City and St. Louis. Poly-Carb's two different sub-contractors applied all the striping within MoDOT specifications and to width, alignment and appearance tolerances. The striping system was installed by two different crews in high traffic conditions on opposite sides of the state which proves that it is a robust easily installed quality striping system, at least initially. Retroreflectivity readings of the contract were met for all of the 13 different projects for the initial period. Readings were specified to be a minimum of 450 for white and 300 for yellow; the lowest average measured retroreflective readings were 506 for white and 349 for yellow and the highest average readings were almost double the minimum specified at 800 for white and 535 for yellow.

It remains to be seen what the annual readings will be for the next four years but the initial retroreflectivity readings were much higher than expected. The contractors request in his Value Engineering proposal to lower the minimum retroreflectivity readings for warranty periods 1 thru 4 were either fears the product couldn't maintain high retroreflectivity for four years or were just an attempt at lowering his risk. The answer to the quality of the striping will have to wait until the annual inspections but so far the test section done in Northeast Missouri and the initial readings on this contract look promising.

As far as the Striping Warranty went it is believed it did quite a bit to bring down the cost and keep the quality high for this specialized product of high visibility, long lasting pavement striping. Although it went through some changes after the contractor, Poly-Carb, presented their Value Engineering proposal it still worked as a performance based warranty contract. The biggest change was the payment percentages allowing Poly-Carb much more money at the time the installation was finished and accepted and limiting the four inspection periods to only 10% of the contract price. The way it was structured, however, the VE proposal gave MoDOT a quality job and an extra savings of \$600,000 and gave the contractor good compensation for the additional risk they were taking compared to a standard contract.

Literature shows that the performance based warranty contracts work best on road maintenance type projects and on large projects with a long term. The contractor deserves to be compensated for the additional risk that he assumes but on a job like this there is an opportunity for him and the state to both realize some savings. This approach can not be used on all projects but was a perfect fit for this project to provide a statewide Striping and Striping Warranty throughout the state of Missouri for 2009 through 2013.

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Demonstrating the Use of Performance-Based Warranties on Highway Construction Projects in
Illinois, Illinois Department of Transportation, 2004

URL: <http://www.dot.il.gov/materials/research/pdf/146.pdf>

Pavement Warrantees: Developing a Trend, Washington State Department of Transportation,
2002

URL: <http://www.wsdot.wa.gov/NR/rdonlyres/FCE05527-5812-4490-ACD7-D820283AF3FD/0/2002Spring.pdf>

2006 Status of the Warrantee Program, Ohio Department of Transportation, 2007

URL:

http://www.dot.state.oh.us/Divisions/ConstructionMgt/Admin/Warranty/Warranty_Report_02012007.PDF

Performance-Based Contracting for Maintenance, Transportation Research Board, 2009

URL: http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_389.pdf

Appendix A

Request For Bid (RFB) Documents Including Questions Submitted/Answers

MISSOURI DEPARTMENT OF TRANSPORTATION
JEFFERSON CITY, MISSOURI
Striping and Striping Warranty

Request No. 2-080717CB

1. Introduction:

1.1 This solicitation seeks bids from qualified organizations to provide Striping and Striping Warranty throughout the state of Missouri with an effective contract period from the Notice to Proceed through June 30, 2012, to the Missouri Highways and Transportation Commission (MHTC) and Missouri Department of Transportation (MoDOT), hereinafter referred to as MoDOT.

2. Scope of Work

2.1 General Requirements

Services: The Offeror shall provide the following professional services:

Contractor to provide and install durable permanent pavement markings on various route in the St. Louis and Kansas City metropolitan areas that meet MoDOT defined performance criteria. The contractor will also warranty their product for a period of 4 years after the installation. Existing pavement markings will be removed and the contractor will install their system according to the guidelines described in the following. This includes mainline and ramp markings, mainline turn lanes and crossovers on the mainline. Outer roads and crossroads at interchanges are not included.

- a. MoDOT will establish defined performance criteria for retroreflectivity, presence and color.
- b. MoDOT will evaluate the pavement markings on the various routes from April 1 – June 1 during the contract period, for a total of 4 warranty evaluations.
- c. An initial evaluation will be done before the end of 2008 to determine if the initial performance criteria are met.
- d. Pavement markings will be evaluated in 1.0-mile segments.
- e. The total contract price will be divided into 5 potential payments. The payment for the initial evaluation will be twelve (12) percent of the total contract cost. There will be four (4) warranty evaluations which will each be eligible for a maximum of twenty-two (22) percent of the total contract cost.
- f. Contractor payment will be based on the number of segments meeting or exceeding performance criteria.
- g. Contractor will provide per foot unit costs for replacement due to maintenance activities.
- h. The various routes to be covered by this contract are listed in attachment A.
- i. Estimated quantities of pavement markings to be installed are listed in attachment B.
- j. The contractor will provide wet reflective pavement markings unless the existing markings are in a milled rumble.
- k. The contractor will complete installation of their pavement marking system on all of the various routes by October 31, 2008.
- l. The contractor will be allowed only one application of their pavement marking system. This excludes any restriping due to maintenance damage.

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- m. The contractor will be allowed to restripe up to 2.5 percent of the total pavement marking applied in a calendar year without effecting payment.
- n. Intersection markings, such as stop bars, turn arrows and hash marks are not part of this contract and will be maintained by MoDOT forces.
- o. The contractor will be responsible for the following marking at interchanges and intersections.
 - Interchanges – the contractor is expected to stripe the ramps to the ramp terminus. Normally this is where the ramp intersects the crossroad. For directional interchanges, the contractor will stripe the ramps to where they terminate on the other freeway.
 - At Grade Crossovers or signalized intersections – the contractor will be responsible for all long line markings within and approaching the intersection. Pavement markings on the side street approaches will not be the contractor's responsibility.

2.2 Specific Requirements:

PERFORMANCE CRITERIA

Performance criteria will be based on what MoDOT considers the minimum acceptable level.

Width and Alignment

- All white markings 6 inches wide.
- All yellow markings 6 inches wide.
- Gore markings will be 12 inches wide.
- Any skip markings or solid lines inside of the edgelines on concrete surfaces will be contrast marking according to the attached job special provision.

Marking Width Tolerance	
Marking Width	Requirement
4 inch	± 1/4 inch
6 inch	± 1/4 inch
10 inches and above	± 1/2 inch

- Lateral deviation shall not exceed one inch in 100 feet.
- Length of ten-foot skip markings shall not deviate more than 3 inches.

Retroreflectivity

- Initial retroreflectivity measured after 7 days but no more than 45 days after the installation of the pavement markings shall meet the following table:

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Initial Performance Retroreflectivity Criteria	
mcd/m²/lux	30 meter Laserlux
White	Yellow
450	300

- The long term warranted retroreflectivity shall meet the following table:

Performance Retroreflectivity Criteria	
mcd/m²/lux	30 meter Laserlux
White	Yellow
250	175

Chromaticity

- Chromaticity shall be within the following FHWA approved color boxes for the life of the marking material.

Daytime Color Specification Limits for Retroreflective Pavement Marking Material With CIE 2° Standard Observer and 45/0 (0/45) Geometry and CIE Standard Illuminant D₆₅

Color	Chromaticity Coordinates (Corner Points)							
	1		2		3		4	
	x	y	x	y	x	y	x	y
White	0.355	0.355	0.305	0.305	0.285	0.325	0.335	0.375
Yellow	0.560	0.440	0.490	0.510	0.420	0.440	0.460	0.400

Appearance

- Ninety-five percent (95%) of the total pavement marking material in a 1.0 mile segment shall remain in place.
- More than fifty-five percent (50%) of any individual skip shall be in place.

2.3 Performance Evaluation

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MoDOT along with contractor representatives will do measurements of the performance criteria. The evaluations will be done by:

- Width and Alignment – during the collection of the retroreflectivity data. If the evaluation team is concerned about the width or alignment of a segment, field measurements will be taken by the team to verify performance.
- Retroreflectivity – primarily with a Laserlux van, handheld retroreflectometers may also be used for spot checks. Retroreflectivity will be strictly based on the retroreflectometer results for each segment.
- Chromaticity – by the MoDOT Chemical Lab at designated test sections using a handheld instrument. Chromaticity readings will be taken when the evaluation team is concerned that the color of a segment may be outside of the allowed coordinate box.
- Appearance – based on subjectivity ratings made during the collection of the retroreflectivity data. If the evaluation team is concerned about the appearance performance of a segment, field evaluations will be taken by the team to verify performance.

Retroreflectometer Calibration

The Laserlux van will be calibrated according to manufacturer's recommendations. The contractor is invited to participate in the calibration process to assure agreement with the calibration. If handheld retroreflectometers are used, they also will be calibrated to manufacturer's recommendations.

Evaluation Periods

There will be five (5) evaluation periods, one initial evaluation and four warranty evaluations.

The initial evaluation period will be conducted between seven and forty-five days after the pavement markings have been placed. This evaluation period will focus on meeting the initial retroreflectivity requirements as well as alignment, width and color.

Warranty evaluation of pavement markings on the various routes will be conducted from April 1 – June 1 prior to each payment period.

The contractor will be notified 1 week before evaluations are to begin to send a representative. The contractor will be supplied a full report at the end of each evaluation period.

In addition, MoDOT will reserve the right to randomly inspect any of the pavement markings on the various routes outside of the payment evaluation periods. These inspections will be part of quality assurance (QA) auditing. The contractor will be notified of the results of these QA auditing inspections.

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Contractor Payments

Payments to the contractor will be based on performance evaluations. Payments will be based on the following:

- The contract will be bid as one complete total cost to provide and install warranted pavement markings on the various routes for the duration of the contract period.
- This total bid price will be divided into 5 potential payment amounts based on the following table.

<i>Payment Percentages Table</i>	
Evaluation Period	Maximum Percent of Total Contract price Available
Initial Performance	12
Warranty Performance 1	22
Warranty Performance 2	22
Warranty Performance 3	22
Warranty Performance 4	22

- Each of these amounts will be the maximum payment available to the contractor per payment period.
- Payment will be based on the performance of individual 1.0 mile segments.
- The total payment available for the performance period will be divided by the available number of 1.0 mile segments available during that payment period.
- Each line on the various routes will be evaluated individually.
- Payment will be based on those segments per line that meet or exceed the performance criteria.
- Failure to meet the performance criteria on any 1.0 mile segment of a line will result in no payment for that segment.
- All repairs shall be completed by Memorial Day.
- Contractor payments will be made according to the following schedule;

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Payment Schedule	
When	Pay Period
December 31, 2008	1
June 30, 2009	2
June 30, 2010	3
June 30, 2011	4
June 30, 2012	5

The contractor will be allowed to repair up to 2.5 percent of the total pavement markings applied in a year and still receive full payment for the next warranty payment period. Failure of more than 2.5 percent of the total pavement markings will deducted for the amount of payment due for that warranty pay period.

Dispute Resolution

If there are irreconcilable disagreements on the retroreflectivity results, the contractor may hire, at their expense, a third party, approved by MoDOT, to take retroreflectivity readings. These readings will be the final numbers used in determining payment.

Material

The contractor has full choice on what material to use to meet the performance criteria, with the following considerations. The contractor has the option of deciding the amount and type of yellow pigment for yellow material. The contractor shall certify that all yellow materials using lead chromate pigments shall meet the criteria of non-hazardous waste as defined by 40 CFR 261.24 when tested in accordance with EPA Method 1311, Toxicity Characteristics Leaching Procedures (TCLP). The striping and marking material, upon preparation and installation, shall not exude fumes that are toxic, or detrimental to persons or property. All material using lead free pigments shall not contain either lead or other Resource Conservation and Recovery Act (RCRA) materials, in excess of the standard defined by EPA Method 3050 and 6010.

Traffic Control

The contractor shall be responsible for providing all traffic control during the pavement marking operations. Traffic control shall be in accordance with the MoDOT *Traffic Control for Field Operations* manual. The contractor shall notify the appropriate Work Zone Coordinator at a MoDOT District Office two (2) MoDOT working days in advance of any work being performed.

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Unless the material is track free at the end of the contractor's application train, traffic channelizers shall be used to protect the markings from traffic. Any claims resulting from vehicles tracking the freshly applied material will be the responsibility of the contractor.

There may be some time restrictions applied as needed, or due to incidents, planned events that generate increased traffic, or to coordinate with other roadway work going on. Due to traffic volumes, the majority of work in the St. Louis and Kansas City areas will be done at night. The District Work Zone Coordinator will advise the contractor if any of the work will be allowed during daylight hours.

Removal of Existing Markings

When removing existing pavement marking, the method of surface preparation or removal shall not cause structural damage to the pavement. Current acceptable methods are water blasting, shot blasting or grinding.

The contractor is expected to have neat, crisp lines. When existing markings are being removed for the application of the contractor's markings, the contractor will completely remove those markings that will impact the appearance of their markings. As an example, skips that have become too wide or too long due to multiple stripings, will be totally removed before the contractor installs their markings.

Layout of New Markings

Prior to installing any permanent pavement markings, the contractor shall notify the Traffic Section at the appropriate District Office. MoDOT forces will work with the contractor to locate the type, color and width of markings prior to placement. Failure of the contractor to contact MoDOT prior to the installation of permanent markings will cause any markings done not in accordance with MoDOT pavement marking guidelines to be considered failed and not available for payment.

Maintenance Activities

During the course of this contract there will be locations where maintenance of the surface or shoulders will be required. If the maintenance activities degrade or destroy the pavement markings, the contractor will not be held responsible. The contractor will provide MoDOT with a unit price, per foot, for replacing permanent pavement markings damaged by maintenance activities.

When either 500 feet or more of continuous line is missing or when 1000 feet or more within a 1-mile stretch are missing, the contractor will begin repair activities. MoDOT will notify the contractor when and where repairs need to be made.

Damage by Others

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If other contractors working on the various routes damage existing contractor installed lines, repair will be handled the same as for maintenance activities.

Damage to Pavement

The pavement markings used by the contractor shall not cause any noticeable damage to the pavement over the life of the contract.

Grooved Installation

The contractor will be allowed to install the permanent markings in a groove, if the installation is in accordance with manufacturer's recommendations. The groove area shall meet the following tolerances:

- Not more than 1 inch wider than the pavement marking
- Not more than 2 foot longer than the pavement marking
- Not deviate laterally more than 3/8 inch in 10 feet
- Depth in accordance with manufacturer's recommendations
- The entire area of the groove shall be sealed with either the permanent pavement marking or other approved sealer.

Failure to meet the above tolerances will result in failure of the markings and no payment will be made.

Warranty

The contractor shall warrant that all pavement markings are in accordance with the performance criteria as defined in this contract. Any pavement markings failing to meet the performance criteria will not be eligible for payment. Failure of the pavement markings due to, but not necessarily limited to, damage by traffic, anti-skid materials, studded tires, tire chains, chemical deicers, snowplowing or other loss of material will be considered cause for no payment. If the markings are damaged by pavement failure or MoDOT surface maintenance operations, the contractor shall replace the damaged markings at the agreed unit price. Evaluation of performance criteria will be done as previously described.

Default

If during any evaluation period, more than ten (10) percent of the pavement markings on the various routes are determined to have failed to meet the performance criteria, the contractor shall be considered in default. The contractor will provide, in writing, to MoDOT a plan to remedy the failures. The contractor will not implement their plan without prior approval from MoDOT. If MoDOT rejects the remediation plan, this contract will be cancelled with no further payment due the contractor.

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Exclusions

Some of the sections currently have Type 2 tape installed on the lane lines. Removing and replacing this tape is not part of the contract. Any tape that is damaged by the contractor's activities shall be replaced by the contractor at no cost to the Commission.

Comparison

As a comparison for determining the pricing of the warranty system, MoDOT is providing the following estimate of the current pavement marking system. The example uses one direction of a divided highway, one mile in length. The estimate is based on the following materials:

Skips are type 2 tape installed once.

Edgelines are contractor installed wet reflective paint installed the first year and restriped by MoDOT forces with high build wet reflective paint in years 2, 3 and 4.

Our estimated costs, per mile of a two lane, one direction divided highway are:

Asphalt	\$13,851.02 per mile
Concrete	\$14,775.02 per mile

The contractor, as part of their submittal, will provide a breakdown of costs per one mile of divided highway similar to the above.

3. Bid Submission

3.1 Each bid must be mailed or hand-delivered in a sealed package to the RFB Coordinator at the General Services Procurement Office. All questions regarding the RFB shall be submitted to the RFB Coordinator. All bids must be received at the General Services Procurement Office located at 830 MoDOT Drive, no later than **10:00 AM, CDT, July 17, 2008**.

RFB Coordinator:

Ms. Cheryl Bonner

Missouri Department of Transportation

830 MoDOT Drive; Jefferson City, MO 65109

P.O. Box 270; Jefferson City, MO 65102

PHONE: (573) 526-8194; FAX: (573) 526-1218

All bids must be received in a sealed package clearly marked "**Striping and Striping Warranty**".

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3.2 Bid Guaranty/Contract Bond:

The Contractor shall provide to the Commission and maintain at all times during the term of the Contract security for performance of the Work as described below (or other assurance satisfactory to the Commission in its sole discretion). Each bond required hereunder shall be provided by a Surety licensed as surety, and qualified to do business in the State of Missouri. The Surety shall be listed in the current United States Department of the Treasury, Fiscal Service, Department Circular 570, *Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies*. The Contract bonds may not be in excess of the underwriting limitation listed in the circular. All bonds shall survive until all work bonded is completed and accepted.

Each bid shall be accompanied by a Bid Bond, Certified Check, Cashier's Check or Bank Money Order payable to the Director of Revenue—Credit State Road Fund for an amount equal to Five (5) Per Cent of the amount of the BID submitted, as a guarantee that the bidder, if awarded the contract, shall annually provide an acceptable performance and payment (Contract bond) or a cashier's check, a bank money order or a certified check made payable to "Director of Revenue—Credit State Road Fund" in an amount of the contract price of all the work eligible for payment that year.

If a BID BOND is used (in lieu of a certified check, cashier's check, or bank money order), it must be in the form provided and executed by the bidder as principal and by a surety company authorized to do business in the State of Missouri as surety. The agent executing the same on behalf of the surety company must attach a current Power of Attorney setting forth his authority to execute the bond involved.

3.3 Bids will be reviewed to determine if it complies with the mandatory requirements and to determine the lowest and responsive bid.

3.4 **Cost Determination** – The low bid shall be determined by the lowest cost submitted on the pricing page.

3.5 **Contract Award** – The contract will be awarded to the lowest responsive bidder determined as specified above.

- a. Award of this bid will be made on an "All or None" basis after reviewing all options, and by using the "lowest and best" principle of award, providing the prices are acceptable to the Commission. In the event of tie low bids, the Commission reserves the right to establish the method to be used in determining the award.

3.6 Open Competition/Request for Bid Document

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- a. It shall be the bidder's responsibility to ask questions, request changes or clarification, or otherwise advise MoDOT if any language, specifications or requirements of an RFB appear to be ambiguous, contradictory, and/or arbitrary, or appear to inadvertently restrict or limit the requirements stated in the RFB to a single source. Any and all communication from bidders regarding specifications, requirements, competitive bid process, etc., must be directed to the buyer from the MoDOT, unless the RFB specifically refers the bidder to another contact. Such communication should be received at least five (5) working days prior to the official bid opening date.

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PRICE PAGE

(A) **FEE SCHEDULE:** The Offeror shall indicate below all fees for providing services in accordance with the provisions and requirements stated herein.

A. 5 Year Performance Striping

\$ 7,166,400.00 (see page 13A)

B. Per foot cost for striping due to maintenance activities.

\$ 27.00*

* Assuming 500 linear feet per instance.

Award will be based on the prices submitted in item A above.

Pavement Marking System

Offerer to describe the pavement marking system(s) proposed for this contract. The proposed pavement marking system(s) will not be part of the bid evaluation but is for informational purposes only.

The system consists of a proven, sophisticated, thermosetting

hybrid polymer technology saturated with proven reflective

media to deliver expected performance criteria mentioned herein.

William Hufgar

Signature

Controller

Title

Description of the computation of the \$/mile for this bid

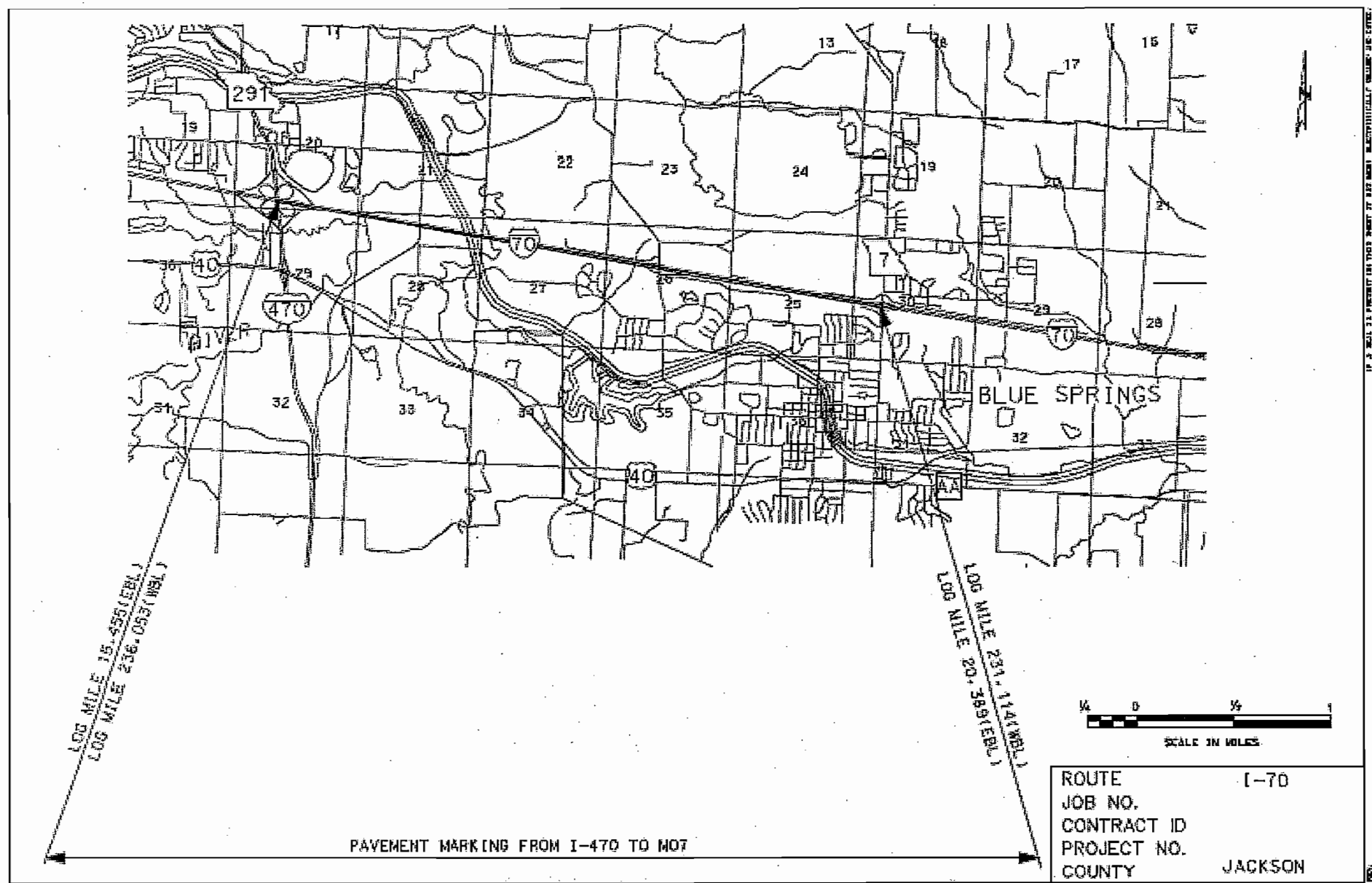
Description	LF
White Solid	1,296,541
Yellow Solid	1,081,575
Intermittent White	408,030
Total Feet Striped	2,786,146

Feet per mile	5280
Liner miles striped (Total Feet Striped/Feet per mile)	528
Stripe miles per 2 lane, one direction highway	2.25
Miles striped (Linear miles stripped/Striped miles per 2 lane, one direction highway)	235

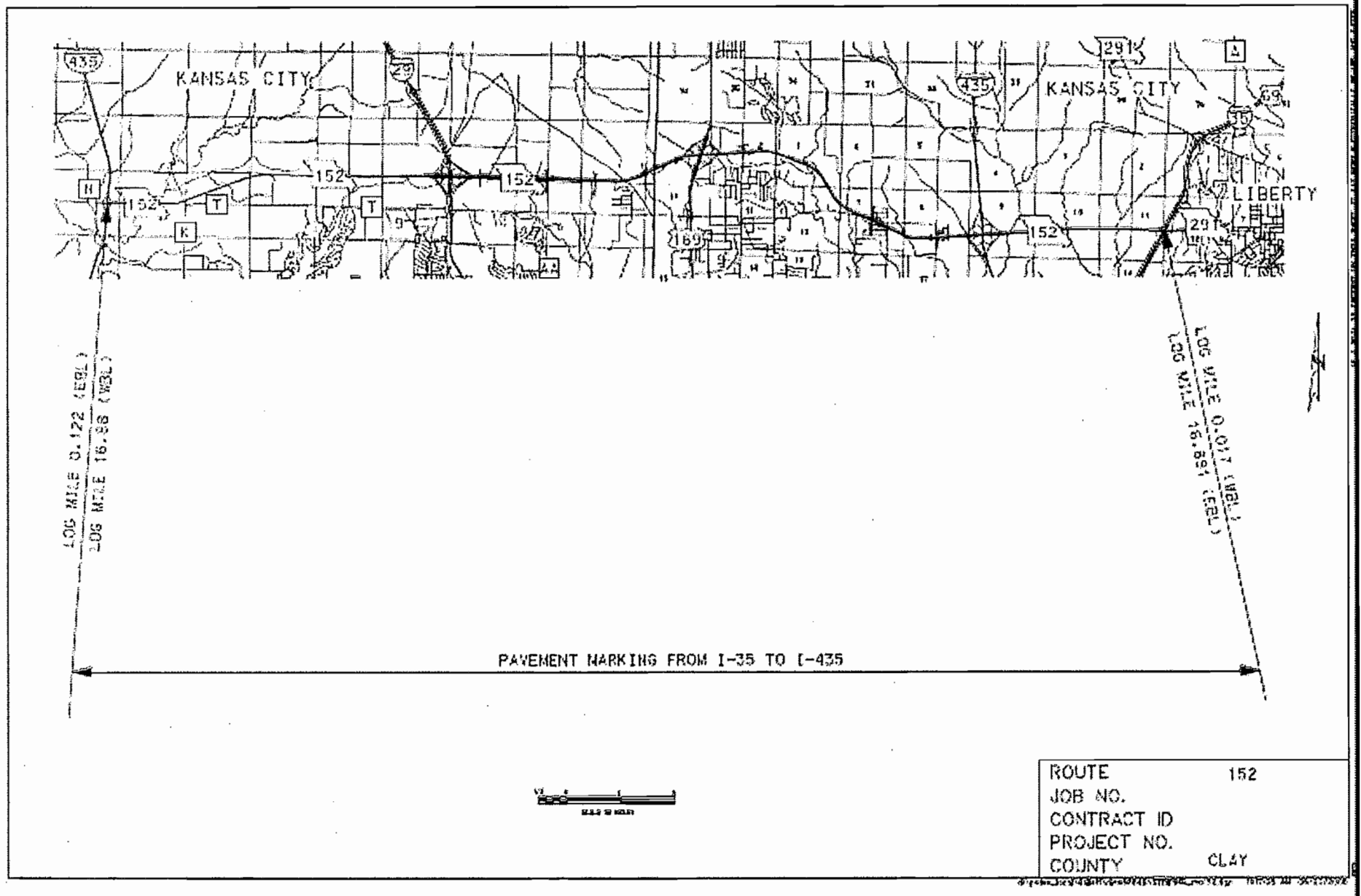
Bid Amount	7,166,400
\$/Mile (Bid Amount/Miles Striped)	30,557

Cg

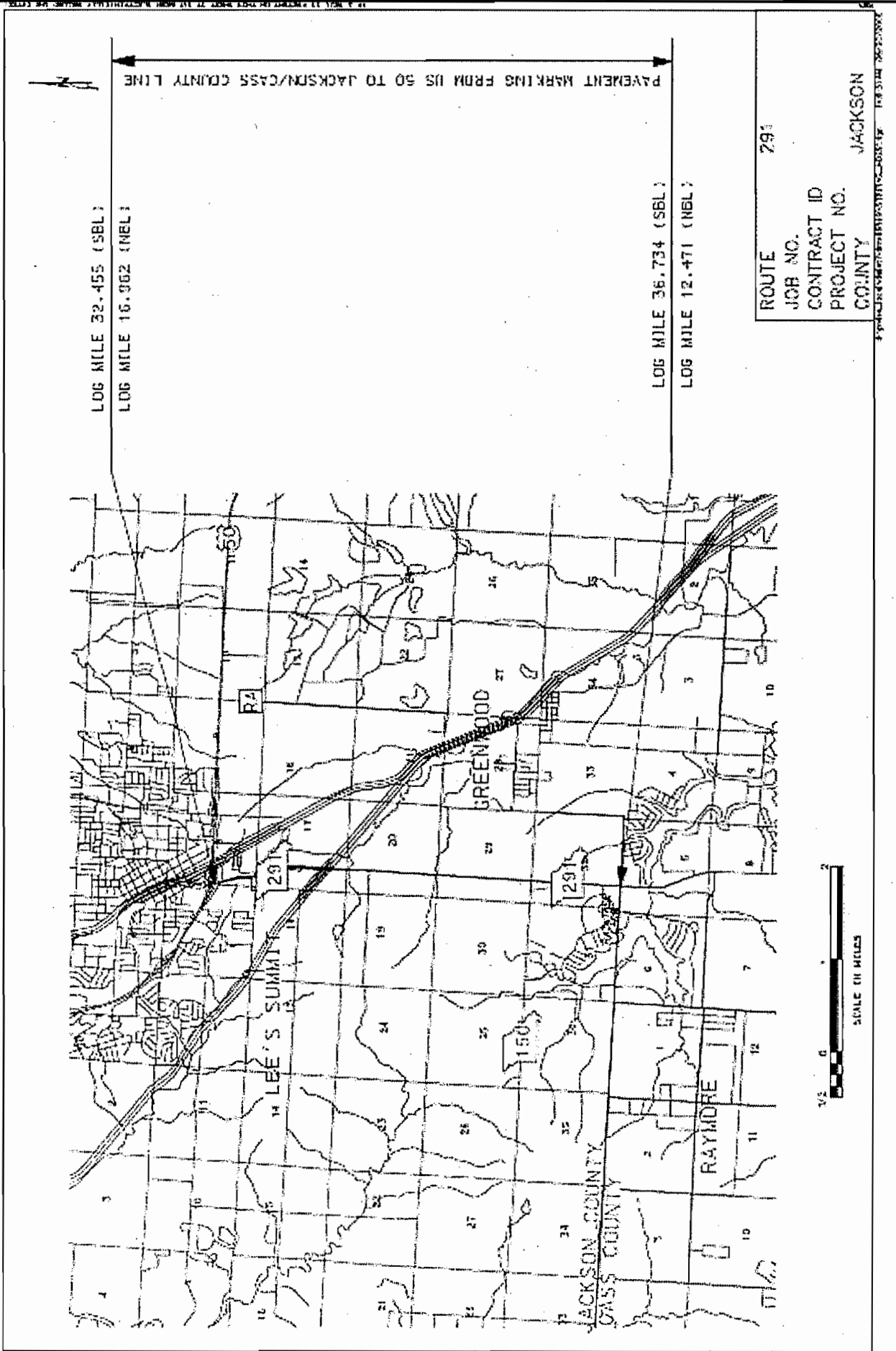
Attachment A - District 4 Kansas City Area



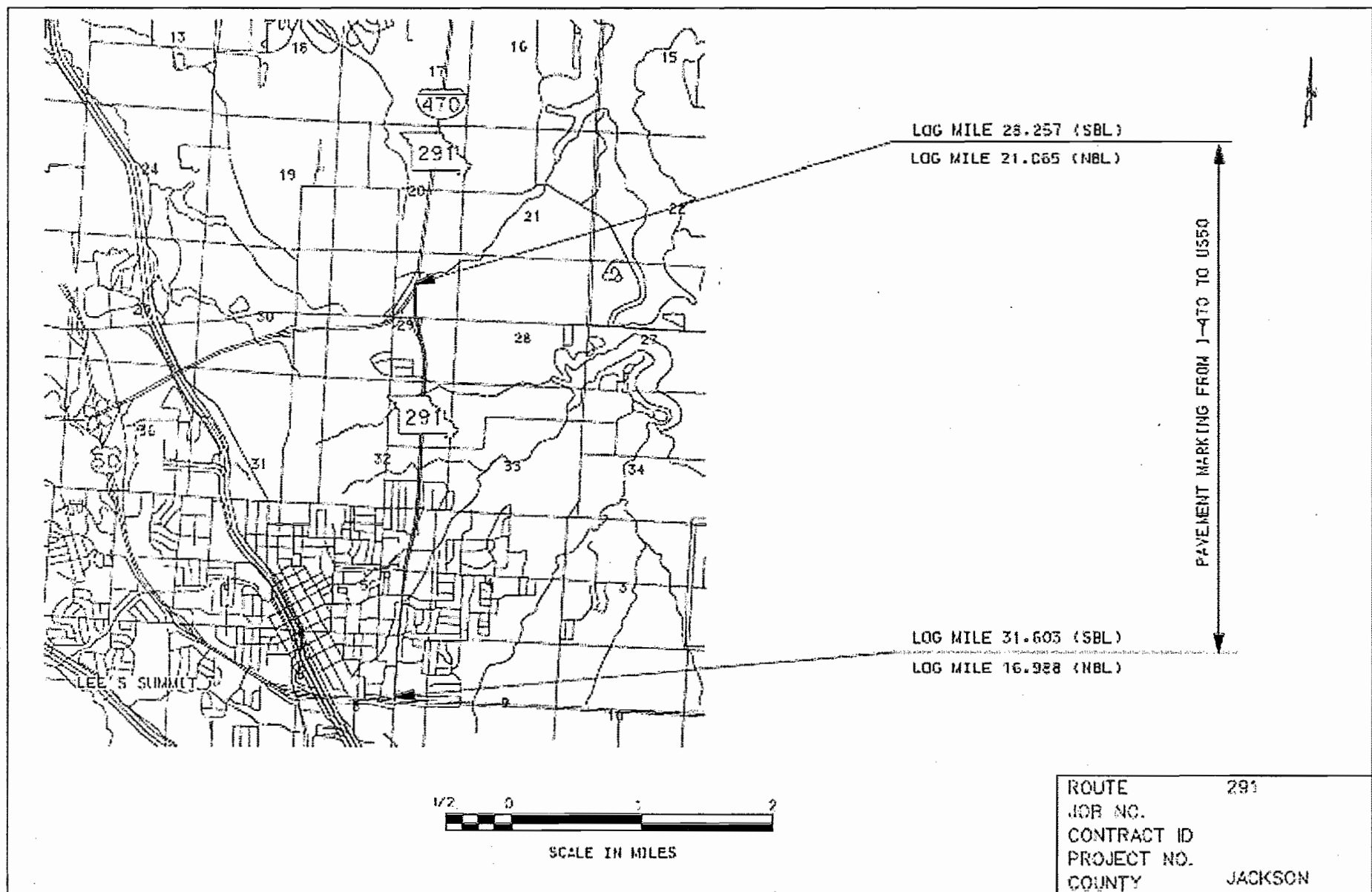
Attachment A - District 4 Kansas City Area



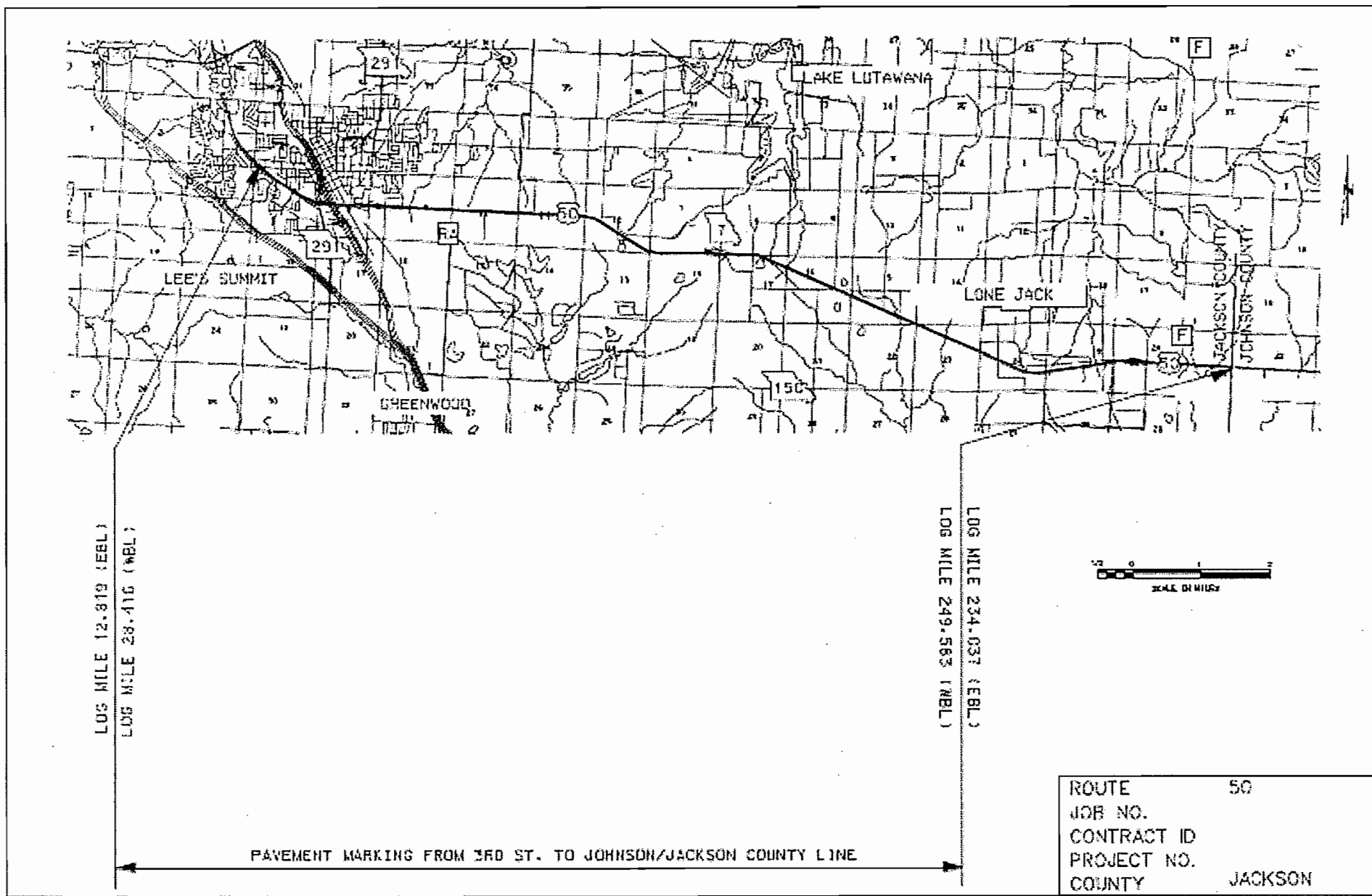
Attachment A - District 4 Kansas City Area



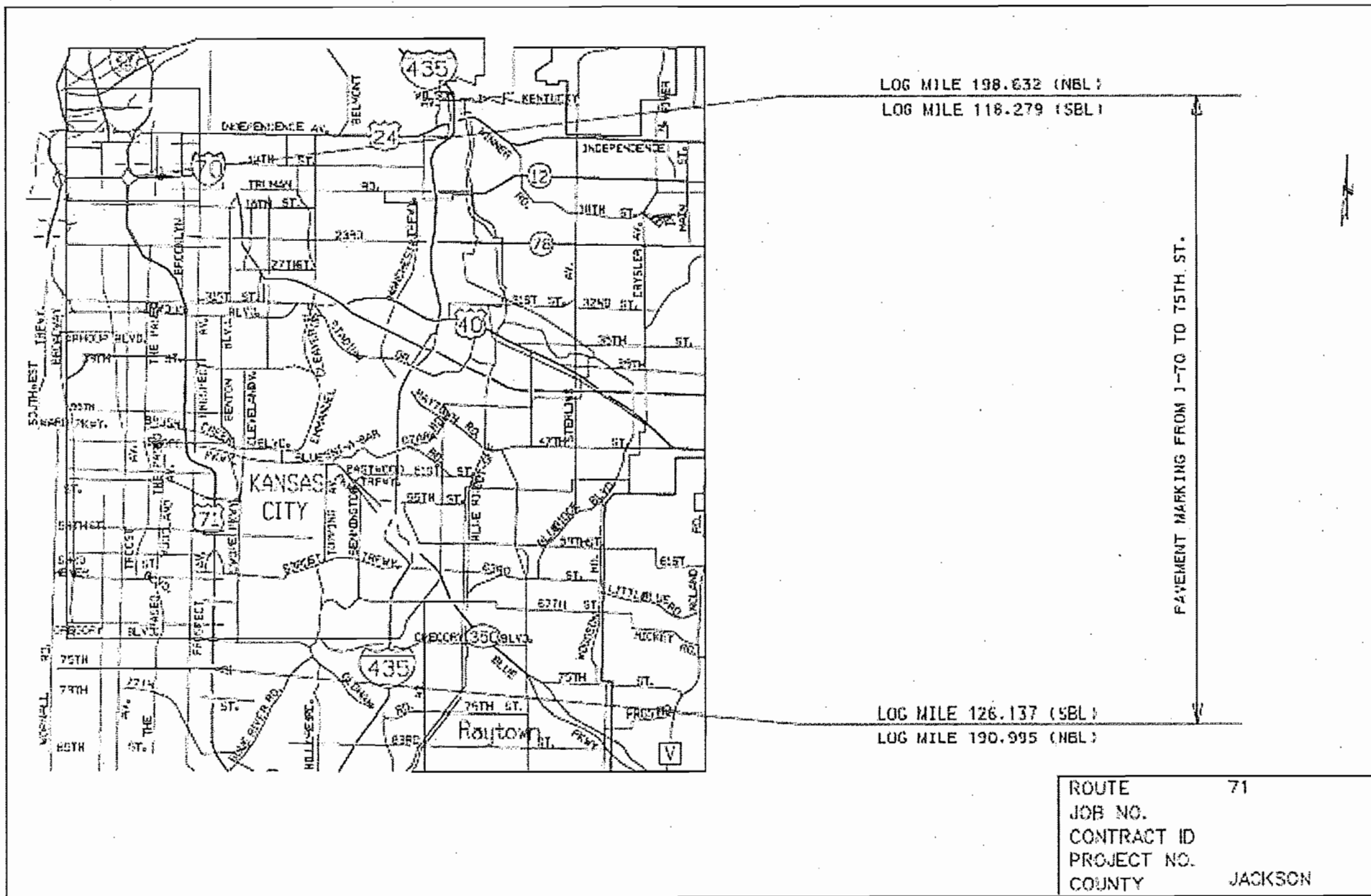
Attachment A - District 4 Kansas City Area



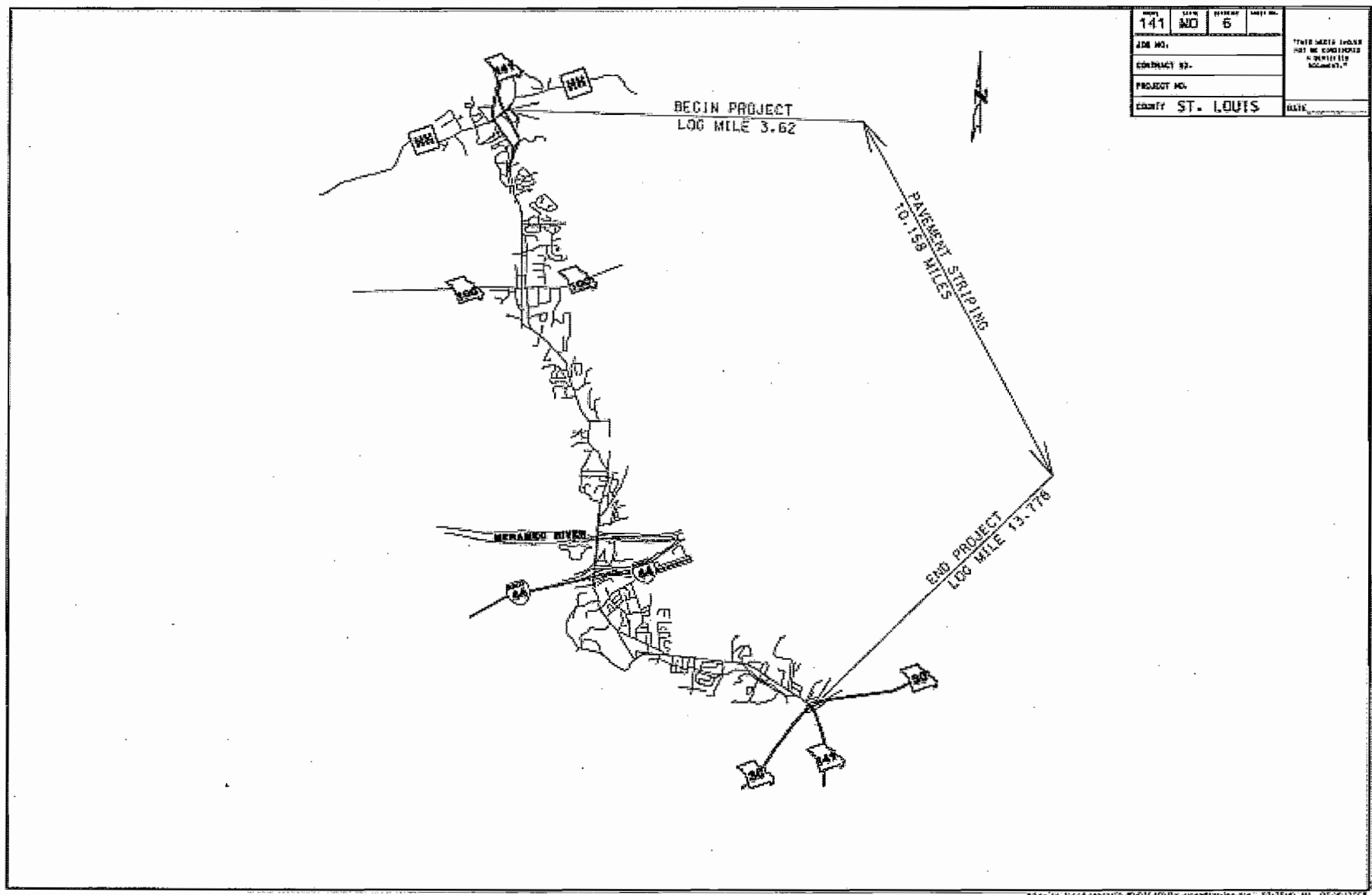
Attachment A - District 4 Kansas City Area



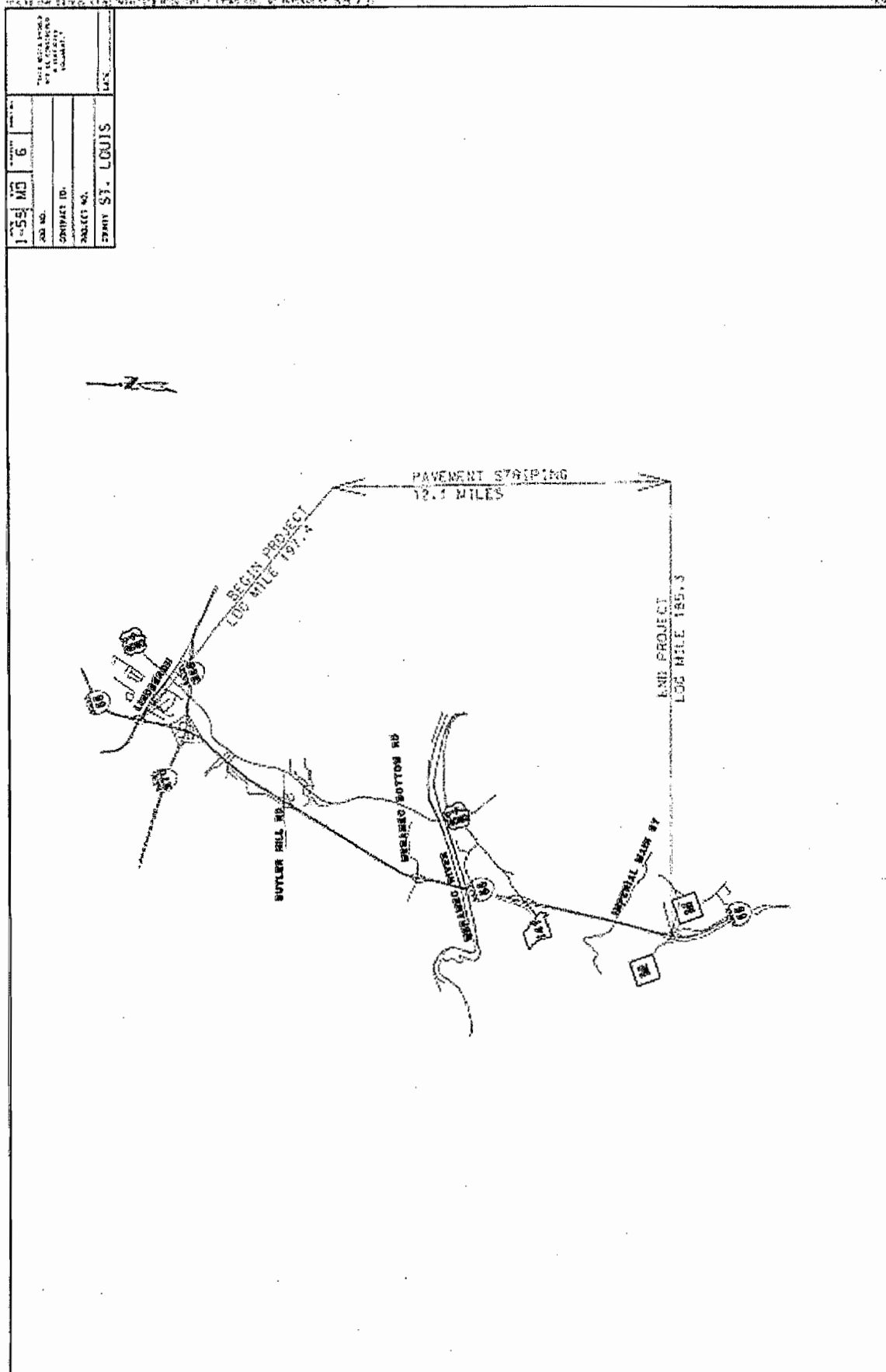
Attachment A - District 4 Kansas City Area



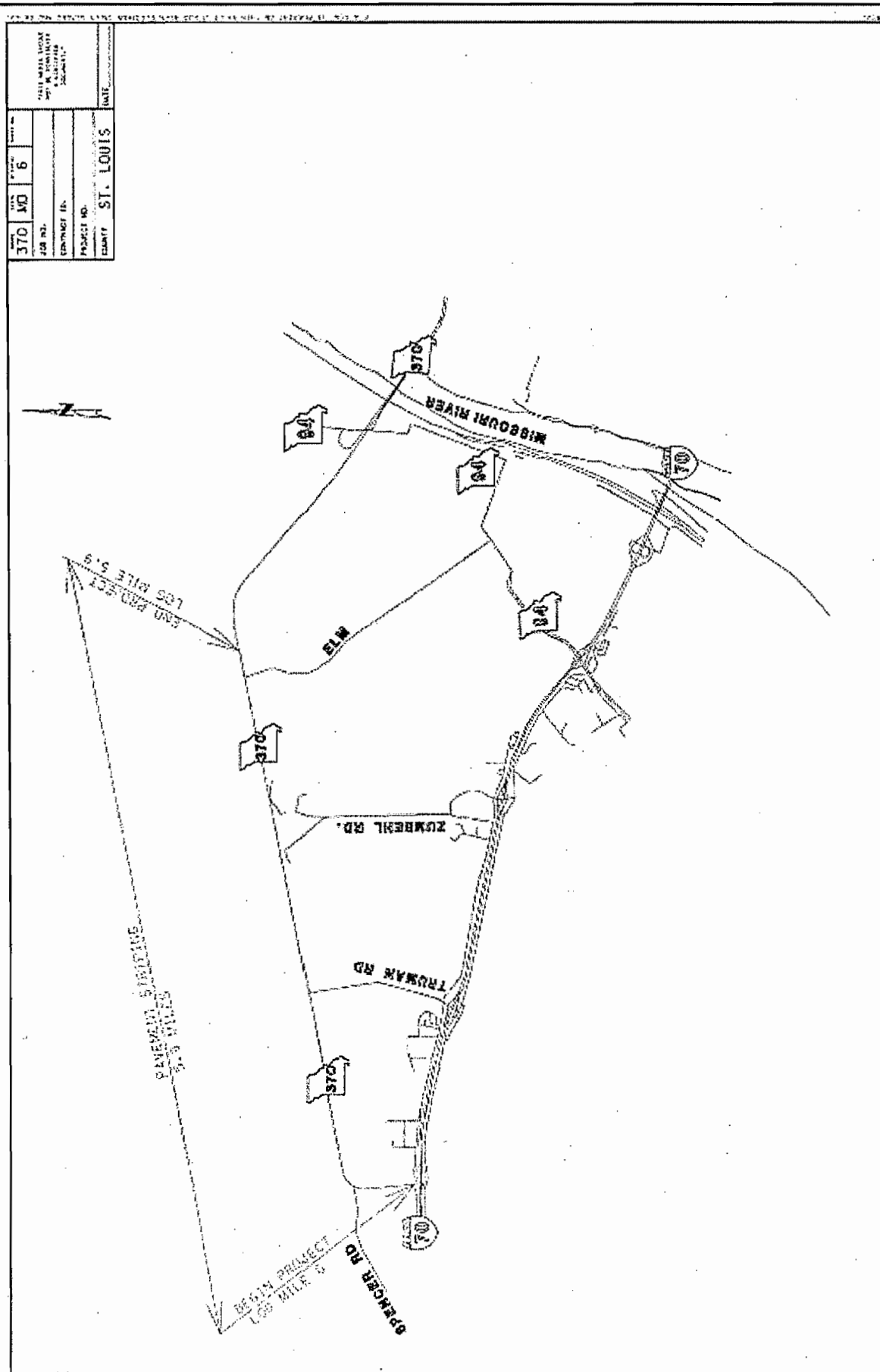
Attachment A - District 6 St. Louis Area



Attachment A - District 6 St. Louis Area



Attachment A - District 6 St. Louis Area



Attachment B

Estimated Quantities, Kansas City Area

MISSOURI DEPARTMENT OF TRANSPORTATION

SUMMARY OF QUANTITIES

ROUTE	DIRECTION	TMS LOG POINT START (DESCRIPTION)	TMS LOG POINT END (DESCRIPTION)	6" SOLID WHITE (LF)	6" INTER. WHITE (LF)	6" SOLID YEL. (LF)	6" INTER. YEL. (LF)	12" SOLID WHITE (LF)	PAVEMENT TYPE	REMARKS
MO 291	North	12.471 (Jackson County Line)	16.962 (US 50)	27,823	5,929	25,713	0	880	CONCRETE	
MO 291	South	32.455 (US 50)	36.734 (Jackson County Line)	26,914	5,649	24,594	0	880	CONCRETE	
I-70	East	15.455 (I-470)	20.389 (MO 7)	35,292	13,026	33,052	0	3,960	CONCRETE	
I-70	West	231.114 (MO 7)	236.053 (I-470)	35,318	13,039	33,078	0	2,640	CONCRETE	
MO 152	East	0.122 (I-435)	16.881 (I-35)	131,508	28,842	119,488	0	13,640	CONCRETE	
MO 152	West	0.017 (I-35)	16.88 (I-435)	131,847	34,580	120,037	0	13,200	CONCRETE	RUMBLE STRIPES (2.268)
US 50	East	12.819 (3rd St.)	28.416 (Johnson County Line)	97,923	20,589	93,353	0	4,400	ASPHALT	
US 50	West	234.037 (Johnson County Line)	249.583 (3rd St.)	93,273	20,521	90,083	0	3,520	ASPHALT	
MO 291	North	16.988 (US 50)	21.065 (I-470)	23,081	4,338	18,351	830	440	ASPHALT	
MO 291	South	28.257 (I-470)	31.603 (US 50)	22,557	4,417	18,667	830	880	ASPHALT	RUMBLE STRIPES (0.739)
US 71	North	190.995 (75th St.)	198.632 (I-70)	59,844	20,162	54,324	0	7,480	CONCRETE	
US 71	South	118.279 (I-70)	126.137 (75th St.)	62,071	20,746	55,491	0	7,040	CONCRETE	
TOTALS				747,251	191,838	686,231	1,660	58,960		

Estimated Quantities, St. Louis Area

RTE 141 PAVEMENT MARKING											
LOCATION	LOG MILE	LOCATION	LOG MILE	LENGTH	# LANES	# LANES	6" WHITE		6" YELLOW	12" WHITE	REMARKS
				(MILES)	SOUTHBOUND	NORTHBOUND	SOLID (FT)	INTERM. (FT)	SOLID (FT)	SOLID (FT)	
RP 141S TO HH	3.62	RP HH TO 141S	4.115	0.495	2	2	5227.2	5227.2	5227.2		
RP HH TO 141S	4.115	CRD MILLODALE	4.64	0.525	3	3	5544	11088	5544		
MILLODALE							1175	0	0		MISC. INTERSECTION MARKING
CRD MILLODALE	4.64	DUTCH MILL	4.926	0.286	3	3	3020.16	6040.32	3020.16		
DUTCH MILL							1240	0	0		MISC. INTERSECTION MARKING
DUTCH MILL	4.926	CLAYWORTH DR	5.111	0.185	3	3	1953.6	3907.2	1953.6		
CLAYWORTH AND SCHOOL							1485	0	0		MISC. INTERSECTION MARKING
CLAYWORTH DR	5.111	BURGUNDY LN	5.386	0.275	3	3	2904	5808	2904		
BURGUNDY LN							1755	0	0		MISC. INTERSECTION MARKING
BURGUNDY LN	5.386	BRITTANY PKWY	5.808	0.422	3	3	4456.32	8912.64	4456.32		
BRITTANY PKWY							1495	0	0		MISC. INTERSECTION MARKING
BRITTANY PKWY	5.808	RP 141S TO 100	6.037	0.229	4	4	2418.24	7254.72	2418.24		
RP 141S TO 100	6.037	RP 100 TO 141S	6.397	0.36	2	2	3801.6	3801.6	3801.6		
RTE 100										2250	4 GORE
RTE 100							3869	2660	2942		MISC. INTERSECTION MARKING
RP 100 TO 141S	6.397	CST CONNECTOR	6.7	0.303	4	3	3199.68	7999.2	3199.68		
CONNECTOR							2210	0	0		MISC. INTERSECTION MARKING
CST CONNECTOR	6.7	CARMAN RD	7.244	0.544	3	3	5744.64	11489.28	5744.64		
CARMAN							1560	0	0		MISC. INTERSECTION MARKING
CARMAN RD	7.244	BROWNFIELD TER	7.471	0.227	3	3	2397.12	4794.24	2397.12		
BROWNFIELD							1155	0	0		MISC. INTERSECTION MARKING
BROWNFIELD TER	7.471	BRIARHURST DR	7.817	0.346	3	3	3653.76	7307.52	3653.76		
BRIARHURST DR							850	0	0		MISC. INTERSECTION MARKING
BRIARHURST DR	7.817	RP 141 TO BIG BEND	7.971	0.154	3	3	1626.24	3252.48	1626.24		
BIG BEND										2473	4 GORE
BIG BEND							3675	1695	3340		MISC. INTERSECTION MARKING
RP 141 TO BIG BEND	7.971	RP BIG BEND TO 141S	8.419	0.448	2	2	4730.88	4730.88	4730.88		
RP BIG BEND TO 141S	8.419	CONNECTOR RD	8.797	0.378	3	3	3991.68	7983.36	3991.68		
CONNECTOR RD							1465	0	0		MISC. INTERSECTION MARKING
CONNECTOR RD	8.797	FOREST AVE	9.425	0.628	3	3	6631.68	13263.36	6631.68		
FOREST AVE							1010	0	0		MISC. INTERSECTION MARKING
FOREST AVE	9.425	MARSHALL RD	9.56	0.135	3	3	1425.6	2851.2	1425.6		
MARSHALL RD							1235	0	0		MISC. INTERSECTION MARKING
MARSHALL RD	9.56	RP 141S TO NDR	10.165	0.605	3	3	6388.8	12777.6	6388.8		
OLD ELAM AVE.							735	0	0		MISC. INTERSECTION MARKING
RP 141S TO NDR	10.165	RP 44 TO 141	10.29	0.125	3	3	1320	2640	1320		
MULTIPLE OUTER ROADS							4960	0	0		MISC. INTERSECTION MARKING
RP 44 TO 141	10.29	CRD MERAVEC STA	10.47	0.18	3	3	1500.8	3001.6	1500.8		
MERAVEC STA							2185	0	0		MISC. INTERSECTION MARKING
CRD MERAVEC STA	10.47	CENTURION DR	10.81	0.34	3	3	3590.4	7180.8	3590.4		
CENTURION DR							1705	0	0		MISC. INTERSECTION MARKING
CENTURION DR	10.81	GLADIATOR DR	11.332	0.522	3	3	5512.32	11024.64	5512.32		
GLADIATOR DR							2428	0	0		MISC. INTERSECTION MARKING
GLADIATOR DR	11.332	BOWLES AVE	12.114	0.782	3	3	8257.92	16515.84	8257.92		
BOWLES AVE							5097	0	0		MISC. INTERSECTION MARKING
BOWLES AVE	12.114	SAN SIMEON WAY	12.638	0.524	3	3	5533.44	11066.88	5533.44		
SAN SIMEON WAY							1765	0	0		MISC. INTERSECTION MARKING
SAN SIMEON WAY	12.638	CAXWOOD DR	13.042	0.404	3	3	4266.24	8532.48	4266.24		
CAXWOOD DR							150	0	0		MISC. INTERSECTION MARKING
CAXWOOD DR	13.042	GREGORY LN	13.327	0.285	3	3	3009.6	6019.2	3009.6		
GREGORY LN							1740	0	0		MISC. INTERSECTION MARKING
GREGORY LN	13.327	FOREST KNOLL DR	13.595	0.268	3	3	2830.08	5660.16	2830.08		
FOREST KNOLL DR							835	0	0		MISC. INTERSECTION MARKING
FOREST KNOLL DR	13.595	ROUTE 30	13.778	0.183	3	3	1932.48	3864.96	1932.48		
SUBTOTAL				10.158			153047.5	209150.4	113550.5	4723.0	
REDUCE FOR INTERM. GAPS								52287.59			
PAYTOTALS							205335.1	113550	4723		

RTE 1-55 SOUTHBOUND PAVEMENT MARKING



RTE 364 PAVEMENT MARKING							
LOCATION	LOG MILE	LENGTH (MILES)	6" WHITE		6" YELLOW	12" WHITE	REMARKS
			SOLID (FT)	INTERM. (FT)	SOLID (FT)	SOLID (FT)	
4.1 MILES EAST OF HARVESTER	12.1		52800	0	52800		
94 & 364 INTERCHANGE			22512		22192		
14 GORE						7245	
MISC. PAVEMENT MARKING ARENA PKWY			5340	0	3980		
4 GORE ARENA INTERSECTION						3187	
MISC. PAVEMENT MARKING MARYLAND EXPWY			5865	0	5865		
4 GORE MARYLAND EXPWY						3255	
MISC. PAVEMENT MARKING BENNINGTON			5415	0	2225		
4 GORE BENNINGTON						2970	
BENNINGTON	2.1		52800	0	52800		
SUBTOTAL		10	144732.0	0.0	139862.0	16657.0	
REDUCE FOR INTERM. CAPS				0			
PAYTOTALS			144732.0		139862	16657	

St. Louis area Summary


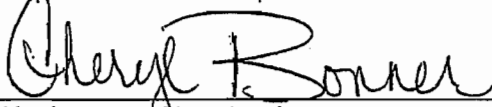
PAVEMENT MARKING					
ROADWAY	LENGTH (MILES)	6" WHITE		6" YELLOW	12" WHITE
		SOLID	INTERM.	SOLID	SOLID
		(FT)	(FT)	(FT)	(FT)
RTE 141	10.158	153047.5	209150.4	11355.5	4723
RTE I-55 NORTHBOUND	12.1	86051	255770	83816	9915
RTE I-55 SOUTHBOUND	12.1	88326	254678	83696	10715
RTE 370 WESTBOUND	5.9	35927	70713.9	35567	3885
RTE 370 EASTBOUND	5.9	41207	74458	41047	2555
RTE 364	10	144732	0	139862	16657
SUBTOTAL		549290.5	864770.3	395343.5	48450.0
REDUCE FOR INTERM. GAPS			216192.575		
PAYTOTALS		765483.1		395344	48450.0

**ADDENDUM 001
REQUEST FOR BIDS
Striping and Striping Warranty
RFB # 2-080717CB**

Bidders shall acknowledge receipt of Addendum 001 (ONE) by signing and including it with the original bid. All other terms and conditions remain unchanged and in full force.

THE BID CLOSING DATE HAS BEEN CHANGED TO JULY 24, 2008, ON OR BEFORE 2:00 P.M. LOCAL TIME.

Please see the attachment detailing the process for the submission of written questions.

Name and Title of Signer (Print or type) RAYMOND SOMICH MARKET MANAGER	Name and Title of Department Authority Cheryl Bonner Senior General Services Specialist
Bidder Signature 	Department of Transportation 
(Signature of person authorized to sign)	(Authorizing Signature)
Date Signed: JULY 23, 2008	Date Signed: 07/10/08

Written Questions: Written questions regarding this RFB will be accepted via fax (573-526-1218), Email (Cheryl.Bonner@modot.mo.gov), or mail (Missouri Department of Transportation, Attn: Cheryl Bonner – Senior General Services Specialist, P.O. Box 270, Jefferson City, MO 65102) until July 16, 2008 at 4:00 p.m. All questions must be directed to Cheryl Bonner. The deadline for MoDOT issuing responses to written comments is July 18, 2008, 4:00 pm.

RFB 2-080717CB – Addendum #2 - Questions Submitted/ Answers

1. Will there be a Pre-Bid Conference? If so, When and where?

No

2. Will MoDOT accept annual renewable bonds for this project?

Yes

3. Per paragraph 2.1 section j; please define "wet reflective" also what are the reflectivity requirements? How will the lines be read for wet reflectivity?

Wet reflective means using one of the wet reflective systems that MoDOT is aware of. At this time, it would be the wet reflective beads manufactured by either 3M, Swarco or Potter's or the wet reflective tape from 3M. We are open to other systems if the contractor can show they have used it in another state and provide the state contacts that can verify the system is wet reflective. At this time, there is not a dependable way to measure the wet reflective properties of pavement markings in a large scale. Wet reflectivity will be determined by looking at random sections of the applied lines to assure that the specified system, including the wet reflective properties, are in place.

4. Under "Grooved Installation" on page 9; please elaborate on the requirements of the last bullet point regarding "sealing"

We want to avoid exposing pavement by excessive grooving. Ideally, the groove would be cut the appropriate size for the marking to be applied. If removal of the existing pavement marking involves an area 100 percent larger than the groove required for permanent marking, then the area beyond the groove will need to be sealed with an appropriate sealer for the type of pavement.

5. Please provide the pavement type for the roads in the St. Louis Area. You provided this for the roads in the Kansas City area.

All of the roads listed in the St. Louis area are concrete.

6. When will these questions be answered?

All questions will be answered and an addendum will be issued by 4:00 p.m. on July 18, 2008.

7. We were wondering what the deduction rate was between 2 1/2% and 10% when you are then in default.

CB

The deduction would be a straight percent for percent reduction. As an example, if 5 percent of the markings needed to be replaced, the contractor payment would be reduced by 5 percent.

8. Are you stating that in your hypothetical you would restripe the job every year yourself or are you saying if we bid to install wet reflective paint the state of Missouri will be restriping our roads every year and handling the maintenance on those roads?

Our hypothetical is based if this warranty project does not happen and we maintain the markings with our current systems and process. The warranty striping is expected to be placed once and remain for the duration of the warranty period.

The example is based on our current system of 3M tape on the skips and MoDOT applied paint on the edgelines. The tape being applied once and our crews painting the edgelines each year for 4 years. This is shown as a comparison on what it would cost us if we did not do the warranty striping project versus what a per mile cost would be for the contractor's proposed system.

9. How can Missouri show yearly recapping when we can only restripe 2.5% or are you allowing for restripe every year and after the reflectivity testing we can only repair up to 2.5%?

We do not want yearly recapping. What we are ideally looking for is a system that will be put down once and will last without additional work for the full 4 years. We allow the 2.5 percent realizing that even the best designed system will have some failures out on the road.

10. Are there any performance requirements for wet reflectivity given that wet reflective markings are required under Section 2.1.j?

See number 3 above.

11. Can you clarify the statement on page 7 that reads, "Failure of more than 2.5 percent of the total pavement markings will deducted for the amount of payment due for that warranty pay period."? Does this modify the payment provisions described on page 6?

Yes. As described above in number 7, the amount due a contractor will be reduced by the percent of restriping they need to do over 2.5 percent.

12. For the purposes of defining default, does the 10% maximum failure refer to 10% of the 1.0 mile segments, or 10% of all markings?

The 10 percent is the aggregate total of all the lines placed.

CB

13. The request document includes detail on the number of lanes in each direction for each road, tabulated with a mileage log for some, but not all segments. Is this detailed information available for all D4 segments?

We do not have the same detailed information for the roads in the Kansas City area, but we are providing the following table that lists the number of lanes per direction in the Kansas City area.

Route	TMS Starting Log Point	TMS Ending Log Point	Direction	Number of Lanes
MO 291	12.471	16.962	N	2
	32.455	36.734	S	2
I - 70	15.455	20.389	E	3
	231.114	236.053	W	3
MO 152	0.122	16.881	E	2
	0.017	16.88	W	2
US 50	12.819	28.416	E	2
	234.037	249.583	W	2
MO 291	17.779	21.065	N	2
	28.257	31.603	S	2
Rte 7	107.958	147.015	N	2
	40.105	78.902	S	2
US 71	190.995	198.632	N	3
	118.279	126.137	S	3

14. Is road surface type available for all D6 segments?

See the answer to question 5.

15. Does the current pavement marking system, provided as a means to compare pricing, meet or exceed the performance criteria of Section 2.2 at all times during the year?

No, we do not hold waterborne paint to the performance criteria in this RFB.

16. In the St. Louis area, can the state document how much pavement is concrete/asphalt, and identify the sections in the tables provided?

CE

See number 3 above.

17. Due to the late start of this project, and the short completion date, can the project be extended for a completion date of May 31, 2009?

a. Assuming award date August 24th, affords 67 calendar days, realistically 30% of days are lost due to weather, leaves little time for completion in a cost effective, reliable and safe environment.

We understand the time constraints a contractor will be under, but we want the work completed this year.

18. Due to the fact that the long term reflectivity on rumble strips is unknown, as well as, if contractors even have the ability to recess in rumble strips, can the reflectivity requirements be waived for rumble strips or held to a lower value?

No, we expect all of the pavement markings to meet the same performance measures.

19. If the default cut off is 10% then contractor needs to be allowed to remedy up to 10%

The contractor will be allowed to remedy up to 10 percent, however there will be a deduction in payment for that percentage over 2.5 percent.

20. Clarify the impact of %age defaults. There is ambiguity in segment, section, route and default definitions related to that.

If more than 10 percent of the total applied markings are determined to be failed, that is when default will be considered.

21. After the 3rd evaluation; if needed, can contractors be allowed a one time recapping opportunity for any/all sections of the project?

No large scale recapping will be allowed. The contractor will be allowed to replace up to 2.5 percent per year with no impact on pay. From 2.5 percent to 10 percent per year will be reduction in payment and over 10 percent will be considered default.

22. Can state clearly identify the location and length of the type 2 tape that is being excluded in project per page 10?

The only section of road that has 3M tape currently installed is MO 364.

CB

23. Comparison of State estimates are unfair and disregard a private enterprise burdens of taxes, overheads etc.

We understand that but offer it as a guide to what we are thinking when evaluating the cost of the warranty striping.

24. Can bidders submit a revised payment plan for the state to review for considerations?

No

25. Can bidders submit a proposal with upfront payment plan?

No

26. Payment at 22% should be offered if stripes meet 48 month RR values and continue to deliver at 60 month period.

After the initial performance review, each of the four warranty performance evaluations, which will be an annual event, will pay up to 22 percent of the total contract price. The final warranty performance payment in 2012 will be the end of the contract.

27. We understand that annual renewable bonds are acceptable. Please tell us what the amount will be each year, i.e. will the bond amount be for the receipts due that year?

The Performance and Payment Bond issued annually will be based on 100% of the contracted work to be done that year.

Annual payment bond percentages:

Year 1 – 34% of contract price
Year 2 – 22% of contract price
Year 3 – 22% of contract price
Year 4 – 22% of contract price

CB

August 21, 2008

Exhibit I

Mr. Kevin Keith
Chief Engineer
Missouri Department of Transportation
105 West Capitol, PO Box 270
Jefferson City, MO 65102

Re: *Striping and Striping Warranty RFB 2-080717CB*

Dear **Mr. Keith**:

In response to your RFB for *Striping and Striping Warranty*, the following is **POLY-CARB's** value-engineered proposal.

1. Project completion date of July 1, 2009.
2. Work allowed during day and night except rush-hours.
District coordination and consent is required.
3. The following retro-reflectivity requirements:

Retro-reflectivity: mcd/m ² /lux	White	Yellow
Initial RR Performance	450	300
Warranted (4 years)	200	150

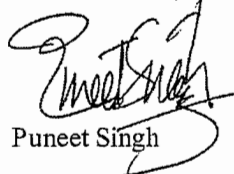
Rumble stripes are exempt from retro-reflectivity requirements.

4. All edge-line and skip-dash markings will contain wet-reflective media.
Gore markings will not.
5. Contractual payment terms of 60% upon completion and 4 payments of 10% each. Bi-weekly progress estimates shall be submitted. Work performed and completed will have warranty evaluations in 2009.
6. **POLY-CARB** will be able to correct any pavement markings installation prior to MODOT's initial acceptance/payment.
7. **POLY-CARB's** Value-Engineered proposal:

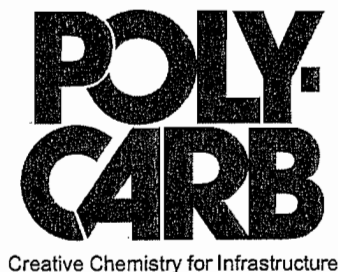
As bid POLY-CARB Proposal	\$ 7,166,400
<i>Value-Engineered Savings</i>	<i>(\$ 600,427)</i>
Value-Engineered Proposal	\$ 6,565,973

Thank you for your consideration. We look forward to serving you.

Warmest regards,
POLY-CARB, Inc.


Puneet Singh

Cc: Dan Patacca, Raymond Somich II, File



POLY-CARB, INC.
33095 Bainbridge Road
Cleveland, Ohio 44139
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866.POLY-CARB (765-9227)
www.poly-carb.com

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Creative Chemistry for Infrastructure

Addendum B: In Follow-up from August 21, 2008 letter regarding *Striping and Striping Warranty RFB 2-080717CB* and August 25, 2008 Addendum.

August 29, 2008

Mr. Kevin Keith

Missouri Department of Transportation

The following is presented in lieu of the previous Item 5(c).

Work completed in 2008 will adhere to the payment date plan as bid.

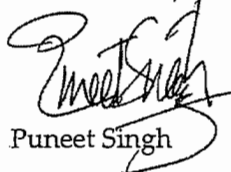
For pavement markings completed during calendar year 2009 and before July 1, 2009, the following payment schedule will be used.

Payment Schedule		
When	Pay Period	Payment Type
August 30, 2009	1	Initial
June 30, 2010	2	Warranty
June 30, 2011	3	Warranty
June 30, 2012	4	Warranty
June 30, 2013	5	Warranty

Thank you for the opportunity to further clarify this matter.
Please contact me should you have further questions.

Respectfully submitted,

POLY-CARB, Inc.



Puneet Singh

Cc: Dan Patacca, Raymond Somich II, File

PS/rcs

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Creative Chemistry for Infrastructure

Addendum: August 21, 2008 letter regarding *Striping and Striping*
Warranty RFB 2-080717CB

August 25, 2008

Mr. Kevin Keith

Missouri Department of Transportation

Exhibit II

The following should clarify these points to our previous communication.

Item 3

The rumble stripes will be installed to meet initial retroreflectivity requirements, but they will not be held to the warranty requirements over the long term.

Item 4

- a) Skip-dash markings will be contrast. Edgelines and gores will not be contrast.
- b) Gore markings will contain wet-reflective media similar to the rest of the lines.

Item 5

- a) POLY-CARB understands no lump sum payment will be made.
- b) Payment is directed as 60% upon location completion (per section of road) and meeting initial performance requirements. Balance of 4 payments at 10% each will be paid upon passing each annual requirement.
- c) Work completed in 2008 will adhere to the payment date plan as bid. 2009 completed work will have its first inspection no later than November 1, 2009.
- d) Bi-weekly estimate reports will be submitted for progress planning and update purposes.

Thank you for the opportunity to clarify these matters. Please contact me should you have further questions.

Respectfully submitted,

POLY-CARB, Inc.

Puneet Singh

Cc: Dan Patacca, Raymond Somich II, File
PS/rcs

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Retroreflectivity Readings

I-70, Manchester to 291/470 & I-70, 291/470 to MO 7

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

MO 291 POLY CARB.xls																						
													% LINE	% LINE	% LINE	% LINE	% LINE	% LINE	% LINE	% LINE		
DATE	FILE	MODOT	BEG	END		R _L	LINE	MATERIAL	YEAR	SUB	AVG	STD	< MIN	> MIN	< 195	195-204	205-214	215-299	299-499	> 499		
SURVEYED	NUMBER	ROUTE	MP	MP	COUNTY	DIR	TYPE	TYPE	STRIPE	RATE	MCD	DEV	225	225	MCD	MCD	MCD	MCD	MCD	MCD		
District 4		POLY CARB																				
8/2/2009	9820570P	291	32.5	36.7	Jackson	S	LEL	EPOXY	2009	5	449	68	0%	100%	0%	0%	0%	0%	37%	63%		
8/2/2009	9820580P	291	12.5	17.0	Jackson	N	LEL	EPOXY	2009	5	436	80	0%	100%	0%	0%	0%	0%	71%	29%		
8/2/2009	98205B0P	291	17.0	21.1	Jackson	N	CL/LEL	EPOXY	2009	5	415	85	0%	100%	0%	0%	0%	0%	74%	26%		
8/2/2009	98205C0P	291	28.3	31.6	Jackson	S	CL/LEL	EPOXY	2009	5	400	78	0%	100%	0%	0%	0%	0%	84%	16%		
													% LINE	% LINE	% LINE	% LINE	% LINE	% LINE	% LINE	% LINE		
													< MIN	> MIN	< 270	270-279	280-289	290-299	300-499	> 499		
													300	300	MCD	MCD	MCD	MCD	MCD	MCD		
8/2/2009	9820590P	291	32.5	36.7	Jackson	S	LL	EPOXY	2009	5	670	92	0%	100%	0%	0%	0%	0%	0%	100%		
8/2/2009	98205A0P	291	12.5	17.0	Jackson	N	LL	EPOXY	2009	5	616	88	0%	100%	0%	0%	0%	0%	0%	100%		
8/2/2009	98201W0J	291	17.0	21.1	Jackson	N	LL	EPOXY	2009	5	758	66	0%	100%	0%	0%	0%	0%	0%	100%		
8/2/2009	98201X0J	291	28.3	31.6	Jackson	S	LL	EPOXY	2009	5	777	70	0%	100%	0%	0%	0%	0%	0%	100%		
8/2/2009	98201S0J	291	32.5	36.7	Jackson	S	REL	EPOXY	2009	5	785	77	0%	100%	0%	0%	0%	0%	0%	100%		
8/2/2009	98201T0J	291	12.5	17.0	Jackson	N	REL	EPOXY	2009	5	759	80	0%	100%	0%	0%	0%	0%	0%	100%		
8/2/2009	98201U0J	291	17.0	21.1	Jackson	N	REL	EPOXY	2009	5	767	82	0%	100%	0%	0%	0%	0%	0%	100%		
8/2/2009	98201V0J	291	28.3	31.6	Jackson	S	REL	EPOXY	2009	5	685	76	0%	100%	0%	0%	0%	0%	0%	100%		
					TOTAL LINE MILES SURVEYED =			48.30														
	0.00	0.00	0.00	0.00	2.65	0	0	0	0	37	63	100										
	0.00	0.00	0.00	0.00	1.31	0	0	0	0	71	29	100										
	0.00	0.00	0.00	0.00	1.07	0	0	0	0	74	26	100										
	0.00	0.00	0.00	0.00	0.53	0	0	0	0	84	16	100										
	0.00	0.00	0.00	0.00	4.20	0	0	0	0	0	100	100										
	0.00	0.00	0.00	0.00	4.50	0	0	0	0	0	100	100										
	0.00	0.00	0.00	0.00	4.10	0	0	0	0	0	100	100										
	0.00	0.00	0.00	0.00	3.30	0	0	0	0	0	100	100										
	0.00	0.00	0.00	0.00	4.20	0	0	0	0	0	100	100										
	0.00	0.00	0.00	0.00	4.50	0	0	0	0	0	100	100										
	0.00	0.00	0.00	0.00	4.10	0	0	0	0	0	100	100										
	0.00	0.00	0.00	0.00	3.30	0	0	0	0	0	100	100										
% Deduction	100%	50%	40%	20%	0%																	
Line Miles	0.00	0.00	0.00	0.00																		
% in Range	0.00%	0.00%	0.00%	0.00%																		



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